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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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- Field Changeable Stops



6000 l/min

Typhoon Remote Controlled
and Manual Monitor

The **Typhoon RC** is designed for 12 or 24 VDC operation, comes with factory installed control panel mounted on the monitor for horizontal rotation, elevation, nozzle pattern, programmable PARK and Oscillate. The Typhoon RC is capable of flowing 6000 l/min while maintaining a FULL 450° horizontal rotation. Electric drives and control box are waterproof.

- Maximum Operating Pressure 14 bar
- Only 1.3 bar friction loss at 6000 l/min
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8000 l/min

Monsoon Remote Controlled
and Manual Monitor

The **Monsoon RC** is designed for 12 or 24 VDC operation, comes with factory installed control panel mounted on the monitor for horizontal rotation, elevation, nozzle pattern, programmable PARK and Oscillate. The Monsoon RC is capable of flowing 8000 l/min while maintaining a FULL 450° horizontal rotation. Electric drives and control box are waterproof.

- Maximum Operating Pressure 14 bar
- Only 1 bar friction loss at 8000 l/min
- Field Changeable Stops



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**March 2008
Issue 25**



Front Cover Picture: Triple deck, Dual fuelled, state of the art, fire training aircraft simulator, installed at a leading UK airport by Simulation International.

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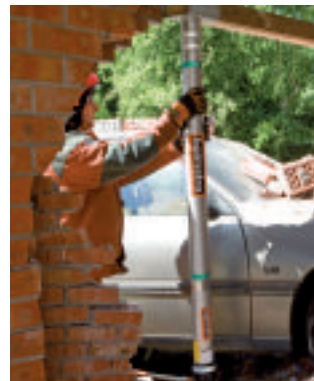
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Foreword

World Safety Conference and Exposition

Fire protection and life safety professionals from around the world will attend NFPA's upcoming *World Safety Conference and Exposition*, which will take place at the Mandalay Bay Convention and Exhibition Center in Las Vegas, Nevada from June 2-5, 2008.

By Olga Caledonia

Executive Director
International
Operations, NFPA

NFPA participates in many conferences and expositions in the Asia-Pacific region; China Fire, Fire India, Fire Australia and Shanghai Fire to name a few. I am sure many of you have had the opportunity to meet with a member of our staff or local membership while attending one of these events. Besides our international outreach efforts through international events, we organize three world class events annually to meet the needs of our members: Americas Fire and Security Expo in Miami, Florida; Mexico Fire and Safety Expo in Mexico City and the World Safety Conference and Exposition which rotates among four major U.S. cities, Las Vegas, Orlando, Boston and Chicago.

Code experts and leading industry authorities teach all of our cutting-edge sessions. The 2008 event will offer over 120 education sessions under 11 tracks, enabling you to customize your learning experience to meet your educational goals.

Arrive early (May 31) and you will find another great opportunity to gain special insight into the codes you rely on for your daily professions when you attend one of NFPA's 24 pre-conference seminars. One- and Two-day Seminar options are available in a variety of code seminars including NFPA 101®, Life Safety Code®, Sprinkler Hydraulics (NFPA 13), Fire Protection Plans Review, Fire Explosions and Investigations NFPA 921 and many more.

Close the conference on a high note with this year's Spotlight Sessions which focus on upcoming

revisions and the newest information for our most popular codes including: Things You Will Want to Know About the 2010 edition of the Alarm Code, NFPA 72® and Sprinkler Actuation with Low-Speed High-Volume Fans. Of special interest to our international audience, Tunnel Safety, Road and Rail; Recent Large-Loss Industrial Fires Involving Impaired Suppression Systems, Fire Protection Strategies for Large Hotel Properties and NFPA's proposed New Project on Commissioning of Fire Protection Systems, NFPA 3!

Networking opportunities abound at WSCE. It is a great opportunity to meet and talk with industry experts, manufacturers and consultants, and to attend a conference program devoted to advances in fire and life safety presented by renowned experts with a vast scope of experiences in international projects. There is no other city in the World that offers the entertainment possibilities of Las Vegas. There is something for everyone among an almost limitless selection of dining options and thousands of other pleasant distractions.

So, mark your calendars now for the 2008 NFPA World Safety Conference and Exposition. **New this year, NFPA will have an international booth in close proximity to the main NFPA booth.** Stop by and take a look at translated products and meet our international staff. For more information visit us online at www.nfpa.org/ and check back often for updates.

See you in Las Vegas!



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Tyco's Hotfoam System protects enclosed spaces

TYCO is claiming growing popularity for its Skum-brand HotFoam system – which operates on very different principles to conventional high expansion foams systems – for protecting enclosed spaces. With HotFoam, the foam generators, which do not have any moving parts and do not require power in any form, are located inside the protected space, using the air and smoke from the fire itself to generate foam bubbles using a specially-formulated foam concentrate.

This does away with the need for an external fresh air supply for the foam production, and provides improved flexibility and effectiveness. In addition, HotFoam's rapid knock-down of the flames and heat helps to minimise damage to the building structure and its contents.

HotFoam has proved to be equally quick and effective extinguishing hydrocarbon and polar solvent liquid fires, as well as fighting fires involving solid combustibles such as rubber, plastic, wood, paper and chemicals. Tyco is citing typical applications that include indoor hazardous areas, such as chemical and petrochemical processing plants, warehouses, and flammable material production facilities. Other particularly appropriate applications are tunnels – including cable tunnels, vehicle and rail tunnels – transformer stations and any spaces where an efficient fire fighting system is required that utilises a minimum amount of water.

A HotFoam installation requires minimal maintenance; air ducts, wall openings and additional smoke ventilation is not called for; pipe positioning is simplified; a pump with only a small capacity is needed; and there is considerable flexibility regarding the positioning of the HotFoam foam generators. HotFoam also has low water consumption. Other benefits include simplified installation, since the low-weight generators can be hung directly in the supply pipes; simultaneous foam production over the entire protected area; and reduced emissions of smoke gases.

The foam station for a HotFoam system consists of a water source; water pump; foam proportioner; Skum's Meteor P foam concentrate; a foam concentrate tank; the HotFoam control system; valves; fittings and piping; and the HotFoam generators.

The introduction of HotFoam followed more than a decade pioneering the technology of producing high expansion foam using smoke-contaminated air. Early tests proved that the introduction of smoke gases in the air supply to conventional high expansion generators reduced, or completely eliminated, the need for foam production by the generator. The same was found to be true if the air supply, in addition to containing smoke, gas and particles, is also very hot.



The system is now approved by the Dutch authorities for fire fighting in areas such as warehouses that contain hazardous materials. SP, the Swedish National Testing and Research Institute, has verified the system for ships' engine rooms, and HotFoam is now approved by all of the major maritime classification societies, including DnV (Det Norske Veritas); ABS (American Bureau of Shipping); BV (Bureau Veritas); GL (Germanischer Lloyd); LRS (Lloyds Register of Shipping); RINA (Registro Italiano Navale); and NMD (Norwegian Maritime Directorate).

Further details on Skum – the Swedish word for foam, which is pronounced "skoom" – solutions and expertise can be found at www.skum.com, or are obtainable by email on tspmarketing.emea@tycoint.com, by telephone on +46 303 57700, or by fax on +46 303 58200

The Fireray 5000 from Fire Fighting Enterprises

Underwriters Laboratories Inc. has evaluated and listed their first motorised beam detector as compliant with the American National Standards for safety. The Fireray 5000 from FIRE FIGHTING ENTERPRISES now boasts certification from UL in addition to LPCB, VdS, CPD & EN54:12, breaking new ground in the development of this smoke detection technology.

The F5000 incorporates several technological advancements that set it apart from previous detectors. A newly-developed motorised beam head works in conjunction with the sensor to automatically optimise the signal strength throughout the life of the unit. This works to keep the beam aligned with the reflective prism even in the event of gradual building shift, and can also factor in environmental factors such as dust buildup. These features strengthen false alarm immunity over time, and help to reduce the need for maintenance operations.

These new additions for the F5000 improve its functionality, whilst it retains the benefits intrinsic to the tried, tested and trusted beam technology that has preceded it: large area coverage per unit (~19800 sq. ft as opposed to ~900 sq. ft for a point type detector), reduced cabling and installation costs, and minimal aesthetic intrusion.

The Fireray's low-level system controller is connected to the detector head by a two-wire cable, and can be used to fully control and adjust the beam – making installation significantly easier. The detector head houses



both the transmitter and receiver, with the beam being bounced off a prismatic reflector on the opposite wall. Beam-type detectors are particularly suited to protecting wide indoor spaces such as warehouses, open-plan offices, corridors and meeting-halls. By covering large areas with few units, costs and disruptions caused by installation and maintenance can be greatly reduced, and the fire security system can be much less obtrusive – which can be of particular benefit in historic or stylish settings.

Fire Fighting Enterprises can offer a complete range of optical beam smoke detectors for all applications. Products include end-to-end, reflective and flameproof variants.

Further information and data sheets can be found on our website at www.ffeuk.com

Bullard Fire Helmets Re-engineered for Superior Comfort



BULLARD, a leading manufacturer in safety equipment, introduces significant advancements in three fire helmet lines. Bullard has upgraded its industry-leading Wildfire® helmet and re-designed the LT

Series and USRX Series helmets, offering users overall superior comfort in helmet protection.

The Bullard Wildfire helmet has been enhanced with an improved suspension system. Featuring keys that install with an audible click, easy vertical adjustments and an absorbent replaceable brow pad, the Bullard Wildfire helmet offers a custom fit for all shapes and sizes.

In addition, Bullard has re-engineered the LT Series helmet and the USRX helmet, developing the most comfortable low profile helmets on the market. Firefighters can now have the low profile look they love without giving up comfort. Through state-of-the-art engineering advancements, both helmets have been redesigned to provide maximum headroom for wearers, a substantial increase from the previous models. The generous amount of head room in the helmets allows firefighters to rely on the safety they trust and the comfort they demand in a lightweight streamlined design.



The thermoplastic LT Series structural firefighting helmet is compliant with NFPA 1971-2007. The thermoplastic USRX helmet meets NFPA 1951-2001 certification for emergency response and 1971-2007 Certification for structural firefighting. Both helmet series feature the Quick-Action™ Blade System that allows for quick installation and removal of faceshields and goggles. The LT and the USRX helmet series offer 12 comfort settings, offering unparalleled customization of fit.

ECOPOL from BIO-EX

BIO-EX is a renowned foam manufacturer, dedicated to develop the most ultimate technology to offer eco-friendly foams.

Confident of the increasing demand for eco-friendly foams, BIO-EX already had approvals for ECOPOL following high level standards, such as EN1568 and GESIP (French Petroleum Safety Committee) on gasoline and Ethanol E92. Always striving to achieve top rating class, BIO-EX recently submitted its ECOPOL to the 'LastFire' test house.

Results have equalled and in most cases out classed traditional AFFF-AR foams, as ECOPOL was rated 3 times at the top score 100 with aspirated nozzle (tap/ sea water) and system (sea water), and acceptable with system (tap water) and semi-aspirated (sea water).

BIO-EX is proud to introduce ECOPOL as a modern answer to address ever growing concern for environment whilst meeting the



high performance required by the petrochemical and chemical industries and Fire Services alike.

ECOPOL is the first truly fluorosurfactant free alcohol resistant (FFF-AR) foam concentrate with proven and tested high performance.

For more information, please contact:

Bio-Ex

Email: export@bio-ex.fr

Website: www.bio-ex.com



Founded in 1898, Bullard is a leading manufacturer of personal protective equipment. Products include thermal imagers, fire and rescue helmets, respirators & air quality equipment and hard hats. The Bullard Emergency Response line features top of the line durable products that users trust to withstand emergency conditions. Bullard offers a full line of fire helmets, from traditional fibreglass to the very latest in high-heat advanced thermoplastic helmets.

For more information, please contact:

Bullard

Website: www.bullard.com

Going Mobile in Taipei . . .

The Taipei City Fire Brigade recently took receipt of a new demountable training unit that has been developed by the Dräger team. As a turn key project this specially developed solution comes complete

with its own prime mover, power generator and fuel supply; as a result it is capable of being deployed almost anywhere, anytime.



Training

The training compartment is equipped with two realistic fire scenarios:

- A storage fire simulation
- A flashover simulation

Each of these can be operated independently from the central control centre which also permits the operator a clear view of the training environment. The intuitive, Windows™ based operating system provides real-time information to the operator in English, German or the local Chinese language.

In addition, a powerful cosmetic smoke generator provides obscurity at the desired level to further enhance the training scenario. Training realism is completed through the inclusion of a 'heated door' scenario whereby the students can train to recognise any number of the pre-cursors to a possible flashover incident. As with all Dräger training systems; this unit has received TÜV accreditation and exceeds the requirements as prescribed by the internationally accepted standard – DIN 14 087.

Control

The training unit is equipped with a computerised touch screen operating system which in turn controls all aspects of the training unit; including

the two fire simulations. To minimise the impact on the environment and provide a repeatable, controllable training environment the unit incorporates Dräger Safety's proven LPG Propane technology.

"This unit will be used to train both new recruits and provide refresher training to our professional fire fighters. The combination of control, repeatability and environmental sensitivity means we can deliver training almost anywhere within our region, day or night." said Mr. Chia-Jung Tsai, Deputy Commander, Taipei City Fire Department.

"We are seeing a growing demand for this style of mobile training platform which can be used to deliver a wide range of modern fire fighting techniques/tactics. The Taipei City Fire Brigade were clear on their requirements and demanded the very highest level of quality and internationally recognised safety systems – these were key considerations in their selection of Dräger" said Mat Lock, Dräger Safety Asia.

The Taipei City Fire Brigade training unit is the latest example of Dräger's commitment to the international fire and rescue communities. As with all Dräger products, their in-house training and service capabilities enable them to fully support each system from delivery to upgrade and refurbishment in many years to come.

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For more information on the training systems or to discuss your training needs please contact:

Mat Lock
Dräger Safety Asia Pte Ltd
 Singapore
 Email:
mat.lock@draeger.com



Interfron New Product Announcement

The INTERFRON SP700 backpack power unit is the perfect solution for vehicle, train or aircraft accidents, where rapid access and prompt intervention are required. Its unique design offers operator safety and mobility, weighing only 18 kg (39.6 lbs).



The unit is powered by a rechargeable 12V DC battery, offering the same tool power outputs as gasoline fired systems. The SP700 may be used to power all rescue tools currently on the market (cutters, spreaders, rams, etc) working at 350, 630 and 720 bar (5100, 9200, 10500 psi). The battery has a run down time of over 30 minutes, and is easily replaced with a fresh power cell.

The SP700 is ideally suited to operation in remote areas, and for RIT, forcible entry, or anywhere combustion exhaust poses a hazard. Its quiet operation allows for a more controlled rescue scene.

The VP700 backpack power unit is identical in weight and function to the SP700. The sturdy outer case allows for operations in the most unforgiving



environments, making it perfectly suited to confined space, and other high hazard areas. The straps provided are robust enough to allow the unit to be lowered by helicopter into an emergency scene.

For more information, please contact:
Interfron SpA
Tel: +39 0 185 263 636
Website: www.interfron-hydraulicrescue.com



Reliable and User-Friendly

Dräger receives Frost & Sullivan Consumer Award for respiratory protection

DRÄGER was awarded with the 2007 Frost & Sullivan Consumer Award for respiratory protection. This award goes to honour the manufacturer which best fulfils the customer's needs in respiratory protection concerning the aspects of safety, ease of use, technical features, comfort and design.

The rating is given based on two studies* from Frost & Sullivan concerning Personal Protective Equipment. In these studies, both users and purchasers of equipment throughout the United States and Europe rated manufacturers on how satisfied they were with the products and solutions which the manufacturers offered for various segments. In the area of respiratory protection, the respiratory protective devices offered from Dräger were rated number one out of eleven manufacturers.

Dräger offers a complete portfolio of respiratory protection products including dust masks, half and full face masks, powered air purifying respirators, air-line supplied systems, self-contained and closed circuit breathing apparatus as well as a complete range of filtering and supplied air escape equipment.

Frost & Sullivan's "Consumer Award" is a part of the "Best Practices Awards". Frost & Sullivan recognizes companies in a variety of regional and global markets that have exceeded through their 'Best Practice' strategies. Branch analysts compare the market participants using detailed interviews, analysis and comprehensive secondary research sources.

For more information, please visit www.draeger.com

Firex Launches in India

Firex India 2008 – 16-18 October 2008 – Pragati Maidan, New Delhi, India

Following the resounding success of the inaugural IFSEC India 2007, organisers CMP Information and CMP Asia are pleased to announce the launch of **FIREX INDIA 2008**, which will take place alongside IFSEC India from 16-18 October at Pragati Maidan, New Delhi, India. The launch exhibition will extend the reach of the already hugely popular International Firex brand, which next takes place at the NEC from 11-14 May 2009.

Together the shows recognise the rapid expansion of the fire and security industries in

India, which are growing by around 47% per year, according to research published by the BSIA last year. The decision to launch Firex India follows months of extensive investigation and discussion with the industry.

Simon Parker, Group Director at CMP Information comments, "Rapid market growth and the corresponding increase in production activity make India a logical focus for our continuing global expansion of the fire and security event family. The overall fire protection market in India is worth almost US\$339mn,

making it a huge area of interest for local and international manufacturers and distributors."

Mr M. Gandhi, Managing Director at CMP Asia comments, "Firex India will be the ideal place for end-users from the IT, ITes, retail, hospitality, residential, industrial plant and health sectors to keep up-to-date with the latest innovations and developments in the fire industry across the South Asian region."

More developments will be announced shortly. Firex India 2008 will adjoin IFSEC India, taking place from 16-18 October 2008 at Pragati Maidan, New Delhi, India.

To register for free entry, please visit www.ifsecindia.com. Companies interested in exhibiting at the 2008 event should contact Gerry Dunphy on gdunphy@cmpi.biz or +44 (0) 20 7921 8063, or contact Anindya Sarangi on anindyas@ubmindia.com or +91 22 66122644.

HelmetVue Thermal Imaging Camera

The HelmetVue thermal imaging camera from Sage Technologies is a state-of-the-art weapon in the firefighter's arsenal of tools to fulfill his mission in a challenging and dangerous environment.

The advent of thermal imaging cameras has substantially aided the firefighter's abilities to navigate through dark and smoke filled spaces. It has also dramatically enhanced his abilities to locate and rescue downed victims and other firefighters. Documented cases abound with examples of lives saved, property preserved and firefighting scenarios shortened due to the availability of thermal imaging technology and the benefits it represents to the firefighting community.

The Sage HelmetVue thermal imaging camera has taken the performance and utility of thermal imaging cameras a step farther by having the entire camera system designed and built to be mounted on the firefighter's helmet. This configuration is truly a "Hands-Free" implementation that allows the firefighter to carry out his mission without having the need to hold a camera while performing his assignment. This hands-free method allows him to do exactly what he did before he had to worry about smoke and darkness. And he can conduct his mission with both hands fully available to rescue victims or handle equipment.

The HelmetVue patented design is the first practical production design for head or helmet mounted use. It has addressed those issues that are of fundamental importance for this type of application. It is small, lightweight, requires very low power, can be moved from helmet to helmet, and it has a center mounted camera that minimizes and virtually eliminates the spatial distortion that can occur from off-center camera locations. These features were all primary goals established for the design team before development was even initiated. And of course, the camera had to be designed to be extremely durable in order to withstand the challenges of the firefighter's environment.

The benefits of a hands free IR camera system primarily rest upon that facts that fewer personnel are required for fire suppression and that individuals are able to perform hand-required tasks while "seeing" in either smoke or darkness. Some of these benefits can be shown as:

- Total hands-free operation during suppression, search/rescue, and overhaul/salvage operations.
- Reduction of search time to locate victims or fire source since tactical teams can be split up, within "seeing" distance of each other, while wearing the units.
- An ergonomic design that enables firefighters/emergency responders to simultaneously see both thermal and normal views.
- No extra attack team personnel "to carry the camera."
- A quick release mechanism that facilitates easy and fast transfer of the camera between firefighters.
- Mounting of the camera along the helmet center-line minimizes spatial disorientation between



normal viewing and the displayed camera image.

- An adjustable OLED display that can be used over either eye, offset for occasional reference, or moved completely out of the user's view.
- A simple and minimized operator control design for ease of use and rapid familiarization cycle.

The camera can be mounted on many helmets by either a bracket secured to the brim or by a helmet strap adaptation. Either method enables the camera to be secured to a quick release mechanism for transfer to another helmet.

Sage has developed a special bracket assembly that allows the camera system to be mounted to the Gallet helmet using the bracket holes in the front of the helmet. Also, a special strap assembly has been developed for the Drager helmet, and is presently undergoing evaluation.

The HelmetVue Firefighter camera system weighs about one pound. It has a 160 x 120 format sensor using amorphous silicon technology. It also has an OLED display which can be moved to the dominant eye or positioned out of the way. In this manner, the firefighter always maintains a spatial orientation of his environment. The system's dimensions are 3" x 3" x 3", and has a field of view of 50 degrees. The system operates on two standard commercial AA Alkaline batteries which provide up to three hours of operation. A low battery indicator is activated to alert the user when the remaining operating time is down to twenty minutes. The housing is made from Ultem material for high temperature compatibility.

The HelmetVue camera is distributed in the United States and Canada by the Total Fire Group Company (Morning Pride), and is marketed as the FireWarrior. Total Fire Group, an ISO 9000 manufacturer, is also the licensed manufacturer of all HelmetVue Firefighter and Fire Warrior cameras. Hundreds of units have been sold and have demonstrated the camera's effectiveness in the most severe environmental conditions.

APF

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ELECTRICAL BUILDING TECHNOLOGY GUANGZHOU reflects that trend towards integration. The event is designed to further the development of the concept of 'building technology', and to create a platform where manufacturers, those involved in the design, planning or construction of buildings can come together and discuss their trade. The fair will take place in Guangzhou from 8–11 June 2008.

For manufacturers and suppliers of electrical engineering, building automation or HVAC technology, it is the prime location in which to meet thousands of architects, designers, engineers, developers, contractors and sellers of electrical building products from all over Asia. The event is held concurrently with the Guangzhou International Lighting Exhibition, and between them the two fairs regularly attract over 45,000 trade visitors; around 10,000 of which are from overseas.

For more information, see www.light-building.messefrankfurt.com or contact the organisers, Guangzhou Guangya Messe Frankfurt, on LBguangzhou@hongkong.messefrankfurt.com

Australian respirator gains NIOSH approval

The new SE40 positive-pressure demand PAPR (powered air-purifying respirator) from SAFETY EQUIPMENT AUSTRALIA has now gained approval according to the recent NIOSH CBRN-PAPR standard.

The respirator passes the stringent tests with flying colours in a variety of warfare agents. Specially designed for first responders, SE40 provides protection against chemical, biological, radiological and nuclear materials.

The SE40 is not like a conventional continuous-flow PAPR, but operates on the demand principle, much like a breathing apparatus. The air supply opens on inhalation, and closes on exhalation. This leads to much less air moving through the filters, greatly extending the life of both filters and battery.

The unit is continuously self-monitoring, and alerts the user of any event that calls for attention, such as the need to replace the battery.

In addition, the fan unit can supply air flows of 400 litres/minute. This means that positive pressure is maintained even at hard work without 'dipping' into negative



pressure and consequent inward leakage, as is often the case in conventional PAPRs.

SE40 is worn on a padded back-pack. Voice communication is maintained through a powerful loudspeaker. The NIOSH-approved SE40 respirator can be used with a variety of protective suits, and comes in a stackable military-grade bag, always at the ready.

**For more information, please contact:
The SEA Group
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Website: www.theseagroup.com**

Bodycote Warringtonfire appoints new MD for Australasia

BODYCOTE WARRINGTONFIRE has appointed Peter Downer as the new Managing Director of its business in Australasia. Peter will have management responsibility for the development and growth of the Bodycote Warringtonfire business in the ASEAN region.

Peter holds a BSc in Engineering, MApps Sc in Fire Safety Design and an MBA, and has extensive commercial experience gained initially with a fire services contractor, product manufacturer and installer. For the last 22 years Peter has worked for a Building Services Consulting Engineering Practice as a divisional manager, where he was successfully involved in all kinds of fire safety and protection items and in project management.

He also represents the consultancy

engineering association in Australia on a number of panels for the development of Australian and New Zealand standards.

Peter will be responsible for Bodycote Warringtonfire's team of respected fire safety engineers, fire protection engineers and testing facility staff as well as growing business and supporting clients.

Paul England, the current managing director will maintain involvement within Bodycote Warringtonfire Australian operations while undertaking a new role as Business Development Director for Bodycote Asia operations.

**For more information, please contact:
Peter Downer
Tel: +61 7 2381700
Email: peter.downer@wfra.com.au**

New Godiva Prima Pump

Hale Products Europe is the home of the world famous Godiva fire pump, standard equipment for many fire services. In particular the Godiva vehicle mounted pump has featured at the rear of virtually all UK fire appliances since the mid 1950s. From the start the Godiva pump brought operational reliability and versatility to the frontline firefighter. Many innovative features have been introduced with Godiva pumps, the successive Godiva models, UMP, UMPX and the World Series have all been a part of this design evolution and now a new design is available – the Godiva Prima.

The Prima uses the existing core design of low and high pressure stages on a single shaft to improve the product reliability and performance – and all in full compliance with EN and NFPA standards.

The overall pump envelope is decreased, making it more compact and easier for vehicle builders to install. External pipework has been eliminated and internalised. The piston primer system now occupies a reduced portion of the whole pump and there is no external pipe between the suction tube and the priming mechanism. Another space saver is the location of the round-the-pump induction system between the suction tube and manifold – no longer projecting to one side.

Concerns over corrosion caused by declining water quality due to aging hydrant networks are addressed by changing the pump materials – the high pressure stage is now all stainless steel and all the main castings are of high strength, high corrosion resistant aluminium. There is still an all bronze pump option available if preferred.

The Prima performance meets and exceeds EN and NFPA ratings – the pump will be available in four capacity sizes, relating to the EN 1028 standard – 2000, 3000, 4000 and 6000 litres per minute at 10 bar pressure and 250 liters per minute at 40 Bars for the high pressure stage. There will also be a single stage, low pressure model to the equivalent EN standards.

The suction tube offers three possible tank-to-pump connection options to allow vehicle builders increased flexibility with their pipework installations and now has a 25° angled droop to avoid suction hose collision with the pump bay floor. Also available is an integrated direct mounted collecting head that makes no increase to overall pump length. For the 3010 and 4010 models the suction tube features a 125mm size tank to pump line to improve the through tank pumping performance for relaying operations.

Mounting platform, with inbuilt anti-vibration mountings, fitted as standard to make the pump installation much easier as the platform is complimentary to European truck chassis dimensions. It is supplied ready fitted with all the necessary water and oil drain points the workshop staff will need to service the pump. It also has fork lift points for



ease of handling when installing and removing the pump.

There are major improvements in priming performance. The piston primers are now engaged by activating an electro-magnetic clutch – in automatic mode, pump pressure will disengage the primer drive when priming has been achieved, but there is still a manually controlled option if preferred. The system uses a single priming valve and the priming system handles less water during the process ensuring a quicker, smoother operation, resulting in less load on moving parts and exposure to waterborne abrasives. More robust inlet and outlet rubbers are fitted, designed to give a two year minimum check period.

In summary the Prima maintains and advances the Godiva reputation for reliability and innovation in vehicle mounted pumps. It has already undergone successful trials with several UK fire brigades in various environments and will soon be in full service.

Hale Products Europe is widely recognized as a leading supplier of front line fire fighting equipment, their product range is focused on vehicle mounted, trailer mounted and portable pumps. They have a long established track record for supplying fire and rescue services in the UK and worldwide.

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For further information about the Prima pump range, please contact us at:
Hale Products Europe
 Charles Street
 Warwick CV34 5LR
 England
 Tel: +44 (0)1926 623600
 Email: godiva@idexcorp.com

Avon Expands into Malaysia

Leading personal respiratory protection specialist AVON RUBBER P.L.C. (AVON) is strategically expanding its operations by opening a new regional office in Kuala Lumpur, Malaysia. The office will serve clients across Asia and Australasia. To mark the occasion, a number of distinguished guests have been invited to the official opening on 28 January 2008.

Attending the event will be Gen. Tan Sri Muhammad Ismail, MINDEF Chief of Army, Gen. Tan Sri Azizan, Chief of Air Force, Admiral Tan. Sri Ramlan, Chief of Navy and Lt. Gen Datuk Mohamad Shahrom Ibrahim, Chief of Staff Armed Forces Hq. Also attending will be Dato' Mohd Khatta, Secretary of National Security Council and Dato' Hamzah, Director General of Fire Services, as well as representatives from the British High Commission and the US Embassy in Kuala Lumpur. Representatives from our distributors and agents throughout the region will also be supporting the official opening.

Avon has identified Asia as an important market and the region is generating significant demand for the

latest CBRN personal protection solutions. This new office will enable Avon to offer local advice and support to the military and first responders in the region and provide the highest possible level of customer service.

David Hinds, regional sales manager for Malaysia, explains: "The new office will make a real difference to our clients in the region. It makes sense for us to establish a permanent base in Malaysia, providing current and future users of Avon Rubber products with local support and expertise operating in the same time zones and giving a faster response"

For more information, please contact:
Avon Protection plc
Email: protection@avon-rubber.com
Website: www.avon-protection.com



IVECO MAGIRUS Fire Fighter Academy hosts the first international forest fire symposium

In June the IVECO MAGIRUS Fire Fighter Academy hosts the first international forest fire symposium in France.

The number and scale of forest fires and extensive blazes have dramatically increased in recent years. If the forecasts are to be believed, this development will continue – not least as a tangible consequence of the worldwide change in climate.

The warming of the earth surface and thus also the ever increasing risk of forest fires is a global problem: meanwhile the risk potentials do not lie any longer in extremely dry areas only – such as California, for example, – but also in Southern and Central Europe.

For fire brigades this development poses an enormous challenge: with regard to tactics and organization as well as being equipped with adequate vehicle and fire fighting technology.

IVECO MAGIRUS – worldwide one of the leading manufacturer of vehicles and technology for fire fighting and civil protection – therefore deals with the explosive subject "forest fire" in terms of a two-day symposium in June 2008. The event that takes place in the context of the 2007 established Fire Fighter Academy and that is especially addressed to fire brigade executive managers, will concern itself in detail with all facets of that challenge.

In lectures, discussions and workouts, renowned referees from different countries and continents will hand on their experiences and impart acknowledgement and capabilities. Additional to the theoretical workshops there are practical demonstrations and presentations.

Venue of the event is the French city Chambéry. On the one hand because the French corporate sister IVECO MAGIRUS CAMIVA, well known as specialist for

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For more information on the GasAlertMax XT, visit www.gasmonitors.com

forest fire fighting vehicles, is based there. On the other hand because the area around Chambéry affords ideal conditions for the extensive practical part of the symposium.

As appointed day for the forest fire symposium of the IVECO MAGIRUS Fire Fighter Academy the 3rd and 4th of June is fixed.

You can find further information, for example about the programme, costs and registration under www.iveco-magirus.net

The training concept for the future

The speed at which Asia Pacific countries are growing the need for rescue and civil protection is astounding. To perform rescue both adequately and correctly the right equipment is necessary, but training is as important.

Training is needed to know what Rescue is, how to handle and how to use the equipment correctly and have the proper know-how of the needed techniques. Still many rescuers are not trained to the adequate level needed and mistakes are made. Care, instead of speed, is crucial in rescue. This is logical seeing the rates at which firemen and fire stations are created in Asia, but to some extent the problem is no different in Europe. How do you train rescuers to the adequate level effectively? One Dutch company named Artesis Academy has developed a successful concept in training and are taking it internationally.



What is the training concept of Artesis Academy?

Simply to train rescuers in the best and most effective way possible. This is achieved by using successfully proven training methods and tools, but more importantly with the objective that the country gets their own instructors. Instructors trained by Artesis are capable of training rescuers themselves using Artesis programs. Artesis has the belief that the only way to achieve the adequate level a country needs to learn or take the knowledge already created by Europe and implement it by using their own instructors and training schools.

The Artesis Rescue Training concept is named ART. ART currently consists of training rescue techniques like extrication and emergency lifting. These are the most common areas in rescue. These modules are currently being trained widely in Europe with great success. The modules consist of a basic and advanced level. After the advanced level a student can continue to become a certified Artesis instructor, or take special modules in heavy rescue, modern car techniques or refreshments courses.

Part of the training is done in a classroom using highly graphical presentations as well as practical hands-on training done by highly skilled instructors, or the countries' own instructors who are capable. Students who finish the training in extrication and lifting will not only receive a certification of accomplishment but also the Rescue Gadget, a pocket-size booklet that is used

as a reference guide. It explains the steps that need to be taken during extrication but in a short representation. Already used in the Netherlands it has proven to be very useful for both beginners as well as more experienced rescuers as it is just not possible to remember everything and a fatal mistake can easily be made. The Rescue Gadget is a perfect aid to learn techniques seen – you can look into it when there is spare time, on they way to the accident or even during, if the specific techniques are not remembered.

The extrication and emergency lifting training can be supported by virtual training. A real life-like program that helps teach students how to do procedures like connecting hydraulic equipment, placement of equipment when dealing with the different dimensions in different scenarios. Learning procedures take up a lot of time to learn, but are essential to start with. Furthermore, practical training of procedures can only be done in small groups and is expensive. Virtual training is ideal to train a team as it is much quicker, cheaper than setting up a practical scenario outside. It has been proven that 30% of training can be done virtual, although practical training will never become obsolete.

The ART concept makes it able to train countries effectively and get them quickly to the needed level. ART is successfully implemented in Europe. Programs can be adjusted and customized to specific needs and all materials can be translated into the local language.

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To learn more contact:
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The Fire Protection Research Foundation: 25 Years On

By Wayne D. Moore

For the past 25 years, the Fire Protection Research Foundation has provided fire and life-safety research that supports the overall mission of the National Fire Protection Association.

The need for technical support to NFPA's codes and standards played a significant role in the Foundation's formation. In the mid-1970s, NFPA staff and the Board of Directors recognized a growing need to provide a resource to enhance the technical basis of NFPA codes and standards. So in 1982, the Board of Directors approved the formation of the National Fire Protection Research Foundation (now known as the Fire Protection Research Foundation).

According to the 1982 Annual Report of the NFPA, the Executive Director of the NFPA Fire Protection Research Foundation was John C. Gerard, former Chief of the Los Angeles Fire Department. The Foundation was registered as a corporation first in Washington, D.C.

Gerard served until 1983 when he was appointed NFPA's Washington, D.C. representative. The 1983 Annual Report of the NFPA notes that the Foundation's office was moved from Washington, D.C. to Quincy, Massachusetts, and Rick Mulhaupt was named Administrator to the Foundation. He was later appointed Executive Director.

An article in the 1982 Fire Journal noted that the 1982 Board of Directors meeting included the appointment of the Foundation's first trustees. Among those appointed was Harry C. Bigglestone. Today, the Research Foundation sponsors the Bigglestone Award, which is given annually to the paper appearing in Fire Technology that best represents excellence in the communication of fire protection concepts.

Mulhaupt served until 2004. Today's staff is Executive Director Kathleen H. Almand, P.E., Program Director Casey C. Grant, P.E. and Foundation Administrator Eric Peterson.

To ensure that research carried out was independent, the Foundation was formed as a separate 401(c)(3) organization. It was given the following mission: to obtain and communicate objective usable solutions to problems from fire and other hazards through research.

From its early days, the Foundation has been engaged in major research programs, both domestic and international in scope, designed to provide the type of information that can better support fire safety codes and standards. Each project is guided by a project technical panel, which provides technical expertise and user input from sponsors, the research community, the fire service, NFPA technical committees, and other stakeholders.

As the Foundation celebrates its 25th anniversary, here is a look back at some highlights through the eyes of some of its key contributors.

Halon alternatives

During the 1980s mankind was confronted with the predicted perils of depleting the Earth's protective stratospheric ozone layer. At that time, both the NFPA and the Fire Protection Research Foundation became directly involved on behalf of the fire protection community. According to Grant, both organizations provided important leadership roles in assisting with the transition away from environmentally harmful chemicals used for fire protection to more environmentally friendly replacements.

The threat of losing the Earth's stratospheric ozone layer depletion is predicted to be profound. During the 1970s and early 1980s, theories were put forth by scientists that man-made chemicals were slowly destroying the earth's stratospheric ozone layer. This layer protects the earth from the sun's harmful ultraviolet radiation, and a depletion of this shield would reduce its effectiveness, causing significant adverse health and environmental effects.

In May 1985, scientists from the British Antarctic Survey published data that shocked the scientific community by showing an annually occurring loss of ozone over the South Pole that was so massive it had previously gone undetected. The hole in the ozone layer soon became a major

prime-time news story. But not until September of 1987 did years of effort in the political arena finally come to fruition with the signing of the Montreal Protocol by the United States, the European Economic Community, and 23 other countries in Montreal, Canada.

Among the chemicals receiving focus were those used for fire protection purposes, and although they were used in much more limited quantities than other more common chemicals like refrigerants, they were considered to be particularly potent in terms of their ability to cause environmental damage. One family of man-made chemicals whose production was banned by the Montreal Protocol are the fire protection halons, which had long been an effective fire protection tool in portable extinguishers and total flooding systems.

At that time the Fire Protection Research Foundation and NFPA became fully engaged to address this problem. In addition to numerous symposia and forums provided all over the world to help educate fire safety professionals everywhere, along with multiple published articles, both the Research Foundation and NFPA took very

Fire risk assessment

From the beginning, the Research Foundation has recognized the value to NFPA codes and standards committees – and to fire protection engineering decision making generally – of the development of fire risk assessment as a language and a set of tools. Two major projects best illustrate this long-time focus.

According to John R. Hall, Jr., Ph.D., Assistant-Vice President of NFPA's Fire Analysis & Research Division, during the latter half of the 1980s, the Foundation sponsored a joint project by NIST, Fire Analysis & Research Division, and Benjamin-Clarke Associates to develop a generic fire risk assessment package for the evaluation of alternative products.

The motivation for the project was to move away from the then-active push to evaluate products solely on the basis of their combustion toxic potency.

According to Richard G. Gann of the Fire Research Division of BFRl at NIST, the model, which would be named Fire Risk Assessment Method (FRAMEworks) combined a fire scenario and behavioral scenario structure with associated probabilities, a zone model for fire development

From the beginning, the Research Foundation has recognized the value to NFPA codes and standards committees – and to fire protection engineering decision making generally – of the development of fire risk assessment as a language and a set of tools.

specific constructive steps.

Specifically, the Fire Protection Research Foundation was engaged in three pivotal research projects that would have direct impact on this global topic. First was an overview report that provided a useful and important summary to clarify what was happening regarding wasteful full-scale field testing of Halon 1301 fire suppression systems. This was published in 1988 as "Halon 1301 Discharge Testing: A Technical Analysis."

Two additional reports followed in 1989, one of which was a follow-up to the aforementioned first report and was called "Enclosure Integrity Procedure for Halon 1301 and Total Flooding Systems."

This provided a specific method for testing enclosures without using a full-scale dump test, and at the time the proposed procedure was inserted as a new Appendix of NFPA 12A (with subsequent inclusion also in NFPA 2001) and today still serves as a classic example of research results being directly used by the NFPA codes and standards process.

The third of the three related Research Foundation reports was also issued in 1989 and has the title "Best and Essential Use: A Methodology." This is a landmark study that was directly used by the United Nations Environment Programme (UNEP) committee that was working on the updates to the Montreal Protocol that would soon follow. As such, this particular Research Foundation report had a far-reaching impact on the fire safety world we know today.

and smoke spread, a smoke alarm activation model, and a toxic impact model.

The second project was more focused and developed a fire risk assessment framework for evaluation of fire protection alternatives for the problem of storage of large quantities of flammable or combustible liquids in consumer-ready containers in big box retail and storage facilities. Sprinklers of various designs could be compared to innovative packaging design, floor drains, and other strategic approaches.

More recently, the Foundation, through a grant from the Department of Homeland Security, has developed a guide for NFPA Committees on Incorporating Risk Concepts in NFPA Codes and Standards.

Fire sprinkler technology

According to Russell P. Fleming, P.E., Executive Vice President of the National Fire Sprinkler Association, during the past 25 years, the Foundation has made many significant contributions to the understanding of fire sprinkler technology, perhaps the most significant of which was the Quick Response Sprinkler Research Project initiated in May 1984.

Building on the development of the residential sprinkler in the late 1970s, the project was aimed at the development and timely introduction of fast response sprinkler technology into codes and standards.

The project was divided into two parts, with advances made both in the area of Early Suppression Fast Response (ESFR) sprinklers for high-challenge



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fires and in the application of the new technology to sprinklers intended for a broad range of occupancies between residential and industrial, now known as quick response (QR) sprinklers.

Fundamental decisions were made at that time, such as the decision to define fast response as an attribute of the sprinkler hardware rather than the installed condition.

The groundwork laid by the Foundation's efforts has proven solid, such that more than 70 percent of the 50 million sprinklers installed last year in the United States and Canada were fast response sprinklers.

Fire detection and alarm systems

In 1990, the National Fire Protection Association Research Foundation, in collaboration with the Fire Detection Institute (FDI), awarded the International Fire Detection Research Project to the Building and Fire Research Laboratories of the National Institute of Standards and Technology (NIST).

According to Wayne D. Moore, P.E., the efforts in this seven-year project looked at three key issues using early versions of computational fluid dynamic (CFD) modeling to determine the effects of flat beamed ceilings on detector and sprinkler

an independent resource for the "code road mapping" of new fire technology as well as an effective means to identify the performance criteria against which such technology will be evaluated.

Responding to Regulatory Restrictions: Many new developments in fire technology have themselves arisen from an innovative response to environmental or other regulatory restrictions. For example, the Foundation's early work on halons and halon replacements provided a vehicle for the acceptance of new and existing technologies by enabling the development and acceptance of relevant performance information.

Performance Basis: Most NFPA standards have traditionally had provisions permitting alternative materials and methods provided justification for equivalency can be provided. The last decade has seen a movement towards the development of performance-based codes and standards, wherein the fire safety objectives of the document can be satisfied using a performance approach. Both of these types of provisions call for the development of technical information to substantiate deviations from prescriptive code requirements. This type of research need dictates a more strategic approach to the development of data, which will inform

Today, the Research Foundation is responding to these challenges with activities in a number of areas, including detection and signaling, hazardous materials, electrical safety, fire suppression, storage of commodities, fire fighter protective clothing and equipment, and others.

response, the effects of sloped ceilings, and the effects of HVAC-induced air flow from slot and various diffusers on smoke detector response.

The research also showed the need to evaluate HVAC systems based on the types of venting used for performance-based smoke detector applications, but did not provide prescriptive changes to NFPA 72®, National Fire Alarm Code®.

The research was the impetus for the first changes made to the application of smoke detectors in beamed ceilings and confirmed the dead air space that had been in the Code for some time. In more recent times, The Foundation has continued this work through modeling and validation studies related to various aspects of detection system design.

Today's codes and standards – today's research needs

Today's codes and standards environment is evolving and research needed to underpin it is changing with it. Among the current issues facing NFPA Committees:

New Technology/New Applications: It has always been a challenge for the existing body of codes and standards to appropriately address the introduction of new technology. Prescriptive provisions are naturally written around existing products, and technology developers often don't know where to start seeking recognition of their innovation in regulation. The Foundation provides

design decisions over a range of scenarios.

Today, the Research Foundation is responding to these challenges with activities in a number of areas, including detection and signaling, hazardous materials, electrical safety, fire suppression, storage of commodities, fire fighter protective clothing and equipment, and others.

Most recently, the Research Foundation has worked to post all of its research reports on its Web site, www.nfpa.org/foundation.

This is an important step in helping to make the results of these research project available to all who are able to utilize this information.

The next 25 Years

Each of these examples describes how the Foundation was able to respond to a codes and standards development issue with critical applied research results. As the Foundation marks its anniversary, its future will remain linked to its projects, reports, and their impact on tomorrow's codes and standards. "The next 25 years will bring new challenges to the fire safety regulatory framework. We welcome the opportunity to meet them," Kathleen Almand says. APF

Thanks to Kathleen A. Almand, P.E.; Casey C. Grant, P.E.; Dr. John R. Hall, Jr.; Russell P. Fleming, P.E.; Wayne D. Moore, P.E.; and Richard D. Gann for their past and present contributions to the Foundation and input in preparing this article.



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Ongoing AES' efforts to handle the New Larger Aeroplane at Changi Airport

By Ang Siew Min

Chief, Airport
Emergency Service,
Civil Aviation Authority
of Singapore
and

Edwin Lim

Staff Officer (Operations
Planning), Airport
Emergency Service

A new chapter of aviation history was written on 25 October 2007, when the inaugural commercial flight of the world's largest passenger airliner, the Airbus 380 (A380), took off from Singapore Changi Airport to Sydney, Australia. Behind that historic moment lies years of planning, detailed studies, consultations with stakeholders and modification works to the airfield and airport.

Changi's planning philosophy has been to ensure that airport infrastructure and services are ready and in time to meet new aviation requirements. The Aircraft Rescue and Firefighting (ARFF) Service – better known as the Airport Emergency Service (AES) in Singapore is an integral part of the airport's operations, without which flight operations would not be possible. AES' planning activities commenced as early as end-2003, resulting in the formation of the AES A380 Preparatory Action Group that prepared for the A380's commencement of services.

To meet the principal objective of saving lives, robust and effective training has always been at the forefront of our operational priorities. Our

planning regime does not stop with the successful launch of the first commercial flight of the A380. In fact, this event serves as an added impetus for AES to enhance our training programmes to better prepare our officers to deal with any incident involving an A380 aircraft.

Familiarisation of the A380

Even before its maiden commercial flight, Singapore had played host to the superjumbo four times. These four trips had given AES officers the opportunities to carry out compatibility trials of our new equipment on the aircraft. In addition, officers took the opportunities to familiarise themselves with the operational aspects of the aircraft,



Upgraded Aircraft Rescue and Firefighting Simulator

No sophisticated IT systems can ever replace the actual 'hands-on' experience of firefighting training. In this regard, tackling a 3-dimensional aircraft fire is no easy feat and therefore requires practical ARFF hands-on training. The Aircraft Rescue and Firefighting Simulator at the AES Fireground – affectionately known as the Red Bird – was given a facelift in May 2007. The upgraded Red Bird, incorporating key features of the A380 such as an extended wingspan, wider fuselage and a higher upper deck, was officially commissioned into service in November 2007.

With this new training facility, firefighters from AES will be able to

such as the opening of cargo compartment doors and emergency exits. More importantly, they could see for themselves the challenges posed by the size and different layouts of the aircraft.

Singapore Airlines has ordered 19 A380 aircraft and took delivery of its first aircraft in October 2007. AES officers have made conscious efforts to conduct regular familiarisation visits to the aircraft when it is docked for maintenance.

Aircraft Virtual Interior Simulator (AVIS)

The AVIS was first developed and commissioned into our training curriculum in 2002. AVIS is an interactive software programme allowing our officers to virtually walk through the various types of aircraft operating at Changi Airport and in the process, enhancing their operational knowledge of the aircraft (e.g. firefighting components, escape routes, cut-in points, emergency exits).

With AVIS, AES officers at Changi now possess a realistic platform which they can access at their own time, on top of the planned training routine. To increase the effectiveness of AVIS, AES is upgrading our current version of the AVIS to include the A380. Once the upgrade is completed in the second half of 2008, staff would be able to walk through the A380 under a virtual reality environment.

come face to face with the challenges of aircraft rescue and firefighting involving an A380. AES officers are required to participate in a 'hot-fire' drill once every three months as part of their individual training roadmap. Each 'hot-fire' drill will be designed to replicate a possible aircraft emergency scenario such as engine fire, undercarriage incident, cargo compartment fire. With the A380 mock-up, firefighters are required to execute the drills as per unit tactical plans to deal with an A380 emergency, with 'injects' thrown in during the course of mitigation. The 'hot-fire' drills not only serve to refresh the operational proficiencies of the officers but also test their decision-making skills.

Emergency Airstairs

AES has always strived to couple realistic training facilities with advanced ARFF capabilities. A huge step was taken to achieve this objective with the commissioning of two Emergency Airstairs in April 2006. The A380's upper deck is conservatively estimated to house about 200 passengers. With a higher passenger density on its upper deck, one of the challenges facing rescuers and passengers is to effect efficient passenger evacuation from the aircraft. The Emergency Airstairs allow AES rescuers to gain quick access to the upper passenger deck of the aircraft, ensuring the swift



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evacuation of passengers from the upper deck.

To improve AES' proficiency, daily station drills are conceived to incorporate the Emergency Airstairs wherever possible. The Emergency Airstairs proves to be a valuable asset in mitigating emergencies not limited to the A380, but to a whole range of other aircraft types (e.g. B777, A345, B747, A330).

Ongoing Challenges

Regardless of how effective our training is, how well-equipped, and how well prepared AES officers are for any A380 incident, overall crisis management will never be successful without the support from our mutual aid agencies under the Airport Emergency Plan (AEP) framework. AES conducts full-scale crash exercises twice a year, which involves the physical deployment of 400-500 personnel from our mutual aid agencies. These exercises facilitate the cross-pollination of ideas and help improve synergy amongst participating agencies.

With the high passenger load of the A380, it is reasonable to assume that resources from all agencies will be stretched. The Changi AEP had been updated to tighten the collaborative crisis management framework. The capacity of facilities such

as the Relatives Holding Area (for Next-of-Kin), Private Matching Area (for reconciliation of survivors) and Casualty Clearance Station (for initial triaging of injured) have also been re-sized. Resources from supporting agencies are augmented to cope with the increased demands and rigours of their work.

As we understand the enormity of these possibilities, the challenge for AES is to come up with non-conventional exercise protocols to test the various cells without affecting airport operations and causing 'exercise fatigue' within the participating agencies. With this in mind, AES has plans to organise partial exercises to inject a greater sense of realism into an A380 accident scenario. This will allow us to harness all resources and channel them into various aspects of the overall crisis management framework for more in-depth testing of individual work cells.

AES will also continue to refine our unit tactical plans to take into account customised configurations of the A380 operated by different airlines, to better prepare firefighters in rescue missions.

AES will continuously devise better ways to uplift its operational readiness and stand ever ready to mitigate emergencies involving the New Larger Aeroplanes (NLA).

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Out of the Darkness... The Glow Bumper from Elkhart Brass

By Chris Martin

Regional Export Sales Manager

Safety is always the top priority for fire-fighters. The safety of the community at large and the safety of the crew are at the top of their list. ELKHART BRASS has been manufacturing firefighting equipment for 105 years and safety is always our priority as well. We understand that our products need to perform under the most critical conditions, and perform flawlessly every time they are used. Any way that we can enhance our products to make them safer is only going to help the firefighter using those products perform safer.

With this emphasis on safety, Elkhart Brass is proud to introduce the Glow Bumper to its arsenal of nozzle options. The patent pending, Glow Bumper is a luminescent phosphorous bumper that is added to the nozzle tip that allows the nozzle to be seen in the darkest of conditions.

The Glow Bumper has the same physical dimension as Elkhart's standard nozzle bumpers, but is made of a heavy-duty phosphorescent thermoplastic elastomer (TPE). It works by absorbing any available light source to charge the phosphorescent TPE allowing it to glow brightly for hours.

This phosphorescent



material is commonly found in the fire service on SBCA gauges and reflective trim, but often only a single layer is applied. In the construction of the Glow Bumper, the entire material that the bumper is made of is phosphorescent material. This means that the Glow Bumper can absorb light quicker even from a very low light source. It also means that it will glow for a much longer time.

When purchasing a new nozzle the Glow Bumper can be specified for a marginal up-charge. They are available on our most popular nozzle lines: the Select-O-Matic® automatic nozzle series, as well as the Chief™ fixed-flow nozzle series.

If one already has Elkhart Brass nozzles and they wish to retro-fit the Glow Bumper to existing nozzles this is not a problem. A retro-fit tool is now available

to assist in replacing these bumpers. This tool allows the user to easily change the standard bumper to the Glow Bumper.

In firefighting the nozzle and handline are often referred to as the "life line". It provides orientation to the crews working on the fire ground. The Glow Bumper acts to make sure that this "life line" is more recognizable, and found quickly in the event that a compromising situation arises. It makes the handline nozzle a safer tool to use and helps firefighters to perform in a safer environment.

For more information, please contact:

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Shut-off unit TT C Shut-off unit TT B

Dimensions 200 x 111 x 272 mm

230 x 126 x 272 mm

Weight 1,760 kg 1,860 kg

Ident-No. 60662433 60663633

Hollow Stream Nozzles TT

T 2130 TT T 2235 TT T 2400 TT T 2750 TT

Tip Ø 25 32 25

Dimensions 135 x Ø 70 mm

135 x Ø 70 mm 232 x Ø 70 mm

Weight 0,800 kg 0,740 kg 0,850 kg

Ident-No. Available from Gimaex-Schmitz

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Task Force Tips' CE approved monitors: Hurricane RC (top), Typhoon RC, and Monsoon RC

TFT's QuadraFog douses firefighting worries

When battling fires with 25mm (1") or 38mm (1½") lines, TASK FORCE TIP's compact QuadraFog offers everything from straight stream to narrow fog to extremely wide protective fogs. This selectable gallonage nozzle comes in either the tip-only configuration for break-and-extend operations or with the stainless ball shutoff valve. Optional colored pistol grips make the QuadraFog quick to find and easy to color code to a particular pre-connection.

The QuadraFog 25mm (1") series uses its unique cut fixed metal fog teeth to produce anything from a strong straight stream to extremely wide fog. The 25 mm (1") offers 20-40-100-150 l/min @ 7 bar versions (5-10-24 or 40 gpm @ 100 psi). Adding either the low-expansion or multi-expansion foam attachments broadens this selectable gallonage nozzle's versatility. (Available with NPSH threads.)

The QuadraFog 38mm (1.5") offers either fixed or stainless steel spinning teeth, and features 110-230-360-470 l/min @ 7 bar (30-60-95-125 gpm @ 100 psi), or also the low pressure 5 bar (75 psi) model. This 38 mm (1½") nozzle boasts both FM approval and NFPA 1964 compliance. To ensure the overall corrosion resistance, TFT uses 316 stainless steel to produce QuadraFog's fixed or spinning teeth. Like the 25mm, the 38 mm nozzle accepts low-expansion or multi-expansion foam attachments. Available with virtually any coupling configuration, it can also be flushed without shutting down!

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For further information, visit www.tft.com or intsales@tft.com



Task Force Tips' QuadraFog is a rugged, dependable, selectable nozzle that's backed by the industry's longest warranty

Unifire OutPut Nozzles

Have you ever wondered, "Are all the expensive and complicated nozzle features, add-ons and 'bells and whistles' offered on the market **actually** helping me and my brigade put out fires? Does it really make sense to spend so much money for all these things?" If you have thought these things, you are not alone, and you are right to be asking yourself these questions!

UNIFIRE has been a leading producer of high quality nozzles for nearly four decades. The Unifire philosophy of making nozzles is simple – behind all the science, the bottom line is that a firefighter needs a nozzle that is basic and easy to use, very reliable, and gets the job done, for a price that makes sense.

Like all of Unifire's nozzles, the Unifire OUTPUT™ series is an outstanding line of high-quality firefighting nozzles. They are simple to use. They are highly effective. They are extremely



why Unifire gives a full 5-year guarantee on its entire line of nozzles.

OUTPUT nozzles come in several sizes, each with an optional pistol grip. They range in maximum capacity from 285 lpm (75 gpm) to 510 lpm (135 gpm), and operating pressures up to 20 bars (290 psi). Like all Unifire nozzles, the OUTPUT nozzles are manufactured in Sweden to the highest standards of quality and craftsmanship.

The same philosophy and standards of quality that go into the OUTPUT nozzles are also applied to the entire line of Unifire nozzles and monitors, which include the Unifire V-Nozzle™ series, Unifighter™ series, APG™ and Jetset™ nozzles, and the all-stainless-steel U50™ and Force™ monitors.

For complete specifications of the OUTPUT nozzles and information about all of Unifire's advanced firefighting technologies, visit Unifire.com



reliable. And, they cost significantly less than many competing nozzles.

OUTPUT nozzles generate a wide, full and effective protecting fog screen immediately when opened. This protects the firefighter with a wide-angle water curtain. Then, to adjust the pattern from fog to jet, simply twist the nozzle head half-way around. You then have a full, efficient jet spray. It's that simple!

The OUTPUT has been designed with a minimum of parts so that there is almost nothing that can break or go wrong. The nozzle is made of high-quality chrome-plated brass, stainless steel, solid rubber bumper and handle, and long-lasting nitrile o-rings. This makes the OUTPUT series extremely durable and highly resistant to corrosion, suitable even for use with salt-water. That is



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Task Force Tips, Inc. Monsoon remote control and manual monitors with 1,100-7,600 l/min (300-2,000gpm) flow ranges are mounted to an aerial platform



Remote Control Monitors reduce risk and maximize firefighting effectiveness

Remote Control Monitors: An Integral Component of Modern Fire Apparatus Specifications

By Rod Carringer

Vice President of Marketing and Sales, Task Force Tips, and lifelong firefighter

From the largest Metropolitan Fire Authority to the smallest rural volunteer department, there is rarely adequate staffing on responding apparatus to quickly and effectively employ the high flowing capabilities of pre-plumbed monitors.

Quite clearly, when the chemical chain reaction we call fire has grown to a level of heat production that cannot be suppressed with smaller (though more maneuverable) hand-held nozzles, the fire-ground commander is often challenged with making the tough decision of mounting a more substantial fire attack. With most of the initial attack team actively involved in fire suppression operations, human resources are often limited. Placing a large caliber stream into operation can be a very labor intensive process.

One solution for maximizing the initial attack fire team's capabilities lies in the deployment and

use of remote controlled monitors pre-plumbed directly into the fire apparatus pumping system. Apparatus manufacturers today recognize that firefighter effectiveness and safety are important considerations in all aspects of fire apparatus design. Remote control monitors allow for rapid deployment, high initial fire flows with limited staffing, and most importantly, they stop the firefighter from having to stand on the top of the apparatus to operate the monitor. Allowing the firefighter to direct the monitor from the ground or the cab of the apparatus provides a level of safety that cannot be achieved using manual

Big fires require large water delivery which often leads to unsafe operating conditions



monitors. Additionally, the ability to aim the monitor remotely also provides an amazing tactical advantage as the operator can better observe the stream and maximize its firefighting effectiveness.

Remote control monitors come in many shapes, sizes, and configurations, and may be specified with multiple nozzle choices and control options. For apparatus such as brush trucks, where pump and roll capabilities are tactically important, small turret style monitors are often mounted at or near the front bumper of the truck. These monitors, many with rated flows of 37-470 litres per minute (10-125 gallons per minute) at 100 psi pressure, are operated from inside the cab and often employ the use of a joystick controller. These controls typically provide left/right and up/down movement of the monitor, as well as nozzle stream pattern adjustment. The most modern models have valve control, programmable oscillation, digital position indicators, and stow functions integrated as part of the overall operational package. Nozzle choice for these smaller monitors typically is manually selected to provide flows as low as 37 l/min (10gpm). On smaller apparatus, with limited water capacity, the need to maximize operational time between refills of the tank is very critical during brush fire suppression operations.

In days gone by, when only small hoselines were used, it was not uncommon to have firefighters riding on the hood or the rear step of the apparatus while attacking the fire. Operating in these dangerous conditions often resulted in injury to firefighters when they fell or were knocked to the ground and quite often ended up under the wheels of the moving truck. Today, the firefighter can sit comfortably and safely in the cab of the apparatus operating the remote monitor in a "point and shoot" or a pre-programmed oscillation mode. From a resource management standpoint, the cost of installing a remote monitor on a brush truck may be quite insignificant when compared to the costs incurred from a firefighter injury.

Remote monitors have become standard

equipment on several specialized firefighting apparatus. Large brush trucks, water tenders (often referred to as tankers), and crash rescue vehicles all take advantage of remote monitors mounted for maximum agent delivery, as well as outstanding operator visibility and safety. While these monitors often have higher flow ratings, from 1,900 l/min (500gpm) to 7600 l/min (2,000gpm), and higher capacity nozzles, the remote controls provide the same functional operating characteristics. Again, even with these higher flowing monitors, the pump and roll capabilities of these apparatus are vital to their mission.

Standard pumpers and pumping apparatus historically have had manual monitors installed on 3in and 4in pre-plumbed waterways. Flow rates typically match the pumping capacity at draft of the apparatus (i.e. 3,800 l/min (1,000gpm) pump capacity would use a 3in waterway and a 3,800-4,500 l/min (1,000-1,250gpm) rated monitor and nozzle, a 6,000 l/min (1,500gpm) or 7,600 l/min (2,000gpm) pump capacity would use a 4in waterway and a 6,000-7,600 l/min (1,500-2,000gpm) rated monitor and nozzle) The manually operated water-flow valve for the monitor is mounted and controlled at the pump-panel operator station, and another firefighter climbs to the top of the apparatus to stand and operate the gun under the direction of the fireground commander. Occasionally, due to height restrictions within the station, the manual monitor may be mounted to an extension pipe that can be manually lifted and put in place up to 18in above its nested position. This allows a monitor to be elevated for use over obstacles such as ladder racks, command cabs, and generators, and when the assignment is completed, it can be lowered to its nested position allowing the apparatus to fit back into the fire station.

One other configuration of manual monitors involves the high flowing monitor component being easily removed from the top of the apparatus and attached to a portable ground base carried elsewhere in a compartment. This configuration



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Task Force Tips, Inc. remote control monitors and nozzles provide flow ranges from 1,900-7600 l/min (500-2000gpm) and can be remotely raised for operation

Rod Carringer is the Vice President of Sales and Marketing for Task Force Tips. For the past twenty one years Rod has had direct oversight of all aspects of distribution including field education of fire service professionals, management of distribution partners, over a dozen TFT field representatives, and an active marketing team. As a 32 year volunteer member of Coolspring and Center Township Fire Departments in LaPorte, Indiana, Rod performs research and development, training and active firefighting duties daily. As past Chief of Operations his experience in suppression activities allows him to serve as a State of Indiana Instructor, and as co-founder of the Duneland Fire School Committee in Northwest Indiana. As a past member of the Fire and Emergency manufacturing and Services Association Board of Directors, he remains active in national association activities and legislative initiatives that support the US Fire Service.

Rod's background and continued activities as a structural firefighter allow him to gain tremendous input from fire agencies around the world. This information is utilized in TFT's New Product Development Team, the Strategic Planning Group, and the Marketing Group's direction as TFT seeks new techniques and products to make the stressful job of fire suppression faster and safer.



provides flexibility in constantly changing fire-ground conditions. The monitor can be taken off the apparatus and used as a high flowing portable monitor in either an offensive or defensive attack.

When new pumping apparatus specifications are being proposed to equipment committees, remote control monitor discussions are becoming common place. The typical departmental view is that the new apparatus is going to provide up to 20 years of service, and that investing in the best and latest technology available will only enhance and assure the progress of the department in the future. Typically valued at up to \$16,000 suggested retail price, these units constitute a very small percentage of the overall cost of the apparatus, yet offer one of the highest returns on investment of any option the equipment committee could choose.

Functionally, remote monitors can be operated from controls directly mounted at the pump operator station, from a control head connected to a plug-in tether, directly from the monitor, or with a completely portable radio frequency controller that allows the operator to move to a position of safety and tactical advantage up to 1,000 feet away. The newest controllers integrate monitor-stow position, oscillating features, vertical and horizontal travel, nozzle-stream adjustment, and valve control into one simple, easy-to-use handheld device.

Aerial apparatus (such as straight sticks, platforms, and ladders) have the longest history with remote control monitor integration. Used extensively for years in big water defensive attacks,

remote control monitors have been a key functional element of aerial designs, maximizing their larger pumping capabilities. Today, taking it one step further, many platform aerals carry twin monitors, one manual for use when there are firefighters in the basket, and one remote controlled that can operated from the aerial turntable, the pump operator station, or from the ground. Installation of these monitors during the apparatus build up has also taken on a whole new element of simplicity for the truck builders as most modern products no long require bundles of wires to make systems operate. Today, with the sophistication of the new apparatus electrical and multiplex designs, remote control monitors, nozzles, and controllers can be integrated simply by connecting two RS485 communication wires into the system.

Rugged dependability, versatility, and ease of operation and installation place today's new remote control monitor system in the "must have" category when specifying apparatus. From the smallest brush truck applications to high volume aerial operations, remote control monitors offer firefighting crews maximum performance with limited staffing, a level of safety never before realized when using manual monitors, and amazing fire ground versatility. Typically 4% or less of the overall cost of the apparatus, remote control monitors offer the highest performance to cost benefit of any component on the truck. For additional information on remote control monitors reference NFPA's 1901 Standard for Fire Apparatus, or manufacturer's websites.

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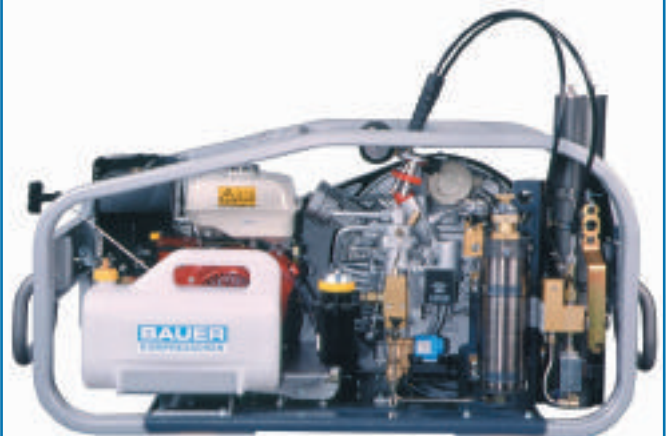
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Picture courtesy of
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Breathing Right

By Katherine Torres

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What happens when employees or worse, employers are not aware that the environment in which they are working is plagued with contaminants?

Media reports of workers falling ill as a result of asbestos exposure, of ongoing respiratory ailments plaguing Ground Zero workers and of the impending threat of an avian flu pandemic all point to one important and obvious conclusion: Effective respiratory protection saves lives and prevents injuries.

"Companies should be monitoring their workplace, identifying contaminants and examining how long workers will be exposed to those contaminants," says Rick Sustello, vice president of marketing at North Safety Products. However, he adds: "Most people don't do this."

After conducting a workplace analysis to determine if respiratory hazards exist, employers are charged by OSHA to eliminate the exposure to toxins through engineering controls whenever possible.

"You aren't supposed to wear a respirator unless you can't possibly eliminate the source of contamination," Sustello points out. "Respirators are a last resort."

Sometimes it is not practical or economically feasible to eliminate the hazard. In that case, OSHA standard 1910.134 and ANSI standard Z88.1992 dictate that if a respirator is necessary to protect the health of an employee, the employer must implement a respiratory protection program.

Determining if a respiratory protection program is needed for your worksite is only half the battle. As Sustello points out, coming up with an efficient program is not that difficult, but the devil is in the details. A suitable respiratory program must include training employees in the proper use and selection of respirators, as well as teaching them about a respirator's capabilities and limitations.

Choosing the Right Respirator

The vast array of choices among respirators can be both a blessing and a curse. Which one to pick? An air-supplied respirator or an air-filtering respirator? Should I use a respirator that is resistant to oil or non-oil resistant?

Picture courtesy of
SEA Group



Step one when developing a respiratory protection program should be knowing the types of contaminants in the workplace environment, says Heinz Ahlers, branch chief of the National Institute for Occupational Safety and Health's (NIOSH) National Personal Protective Technology Laboratory (NPPTL) in Pittsburgh. "One type of respirator, such as the air-purifying respirator, is limited in that it is specific to certain types of contaminants," he says. "If the worker is exposed to more-hazardous chemicals or other types of gases, then they need to use a different kind of respirator such as an air-supplying respirator."

Surprisingly, having too much protection can come at a cost as well. As Roland Berry Ann, acting program manager for respiratory protection at NPPTL explains, putting a person in charge of sweeping a dusty floor in a self-contained-breathing apparatus (SCBA) is not only senseless, but it also can cause that person to become ill.

"There is very little advantage in having a respirator that is a lot more protective than what you need," he explains. "More protective respirators are not only more expensive, but they also are harder to breathe through and they also weigh a lot more."

In addition, workers wearing some types of respirators need medical clearance. According to Sustello, workers suffering from asthma or reduced lung capacity might not be able to breathe through some respirators.

Many factors determine who should wear respirators, how they should wear them and when they should wear them, which is why experts say one person often the safety professional or industrial hygienist should make the recommendations for respiratory protection.

But the recommendation is useless if the person placed in charge and the employees are not properly trained, states Roy McKay, Ph.D., director of occupational pulmonary services at the University of Cincinnati.

Importance of Education

For many years, McKay has offered comprehensive education programs on respiratory protection and the requirements for meeting OSHA and ANSI standards. Although the end goal of the program is to have the person who will be in charge of administering the respiratory protection program trained to effectively conduct respirator fit tests,

McKay says the courses also aim to educate students in all areas of respirator use such as storage, maintenance, use and discarding of the respirator.

"Training is very important when a respiratory protection program is started," he says. "They not only need to be familiar with the requirements, but they also must be knowledgeable of the terminology."

Becoming familiar with respirator terminology is important, as not knowing it could easily take the air out of a program that started out with the best intentions. One of the main issues McKay sees is that companies not well-versed in respirator terminology don't perform respirator fit tests, a crucial step when select-

ing a respirator, because they confuse it with another important procedure called a user seal check.

McKay says the confusion comes from a point in time when the user seal check procedure was referred to as a fit check. He stresses that a seal check is very different from fit testing. "The fit test detects if the respirator fits the wearer correctly and performing a user seal test makes sure the straps are correctly adjusted and the respirator is properly seated to the face," he says. "If the person is unable to properly evaluate a user seal check, then information gained from a fit test is not valuable."

Fit Testing: Qualitative or Quantitative?

Not understanding the difference between fit testing and a user seal check is one thing, but some companies still aren't complying with fit-testing requirements at all, says Andy Coats, president and owner of Occupational Health Dynamics, a manufacturer of one of the new quantitative fit testing systems called the OHD 3000. The ones that do comply often don't follow the requirements correctly, says Coats, who adds: "There definitely could be a better emphasis on fit testing."

Fit testing is important because the procedure lets the end user know if the mask fits right. Because respirators fit everyone differently, it is important to fit test each worker who is required



Picture courtesy of SEA Group

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11 Rules to Jumpstart a Successful Respiratory Protection Program

According to experts in the respiratory protection fields, the best way to get a respiratory protection program started at any company is to go to the OSHA Web site and use their sample program as a roadmap.

"Many people forget they can just go to the OSHA site if they have any questions," says Rick Sustello, vice president of marketing at North Safety Products.

An effective respirator program as adapted from A Guide to Respiratory Protection for the Asbestos Abatement Industry, (U.S.EPA/NIOSH publication, EPA-560- OPTS86-001 September 1986) should include the following 11 components:

- 1** A written statement of company policy, including assignment of individual responsibility, accountability and authority for required activities of the respiratory protection program.
- 2** Written standard operating procedures governing the selection and use of respirators.
- 3** Respirator selection (from NIOSH-approved and certified models) on the basis of hazards to which the worker is exposed.
- 4** Medical examinations of workers to determine whether or not they may be assigned an activity where negative-pressure respiratory protection is required.
- 5** Employee training in the proper use and limitations of respirators (as well as a way to evaluate the skill and knowledge obtained by the worker through training).
- 6** Respirator fit testing.
- 7** Regular cleaning and disinfecting of respirators.
- 8** Routine inspection of respirators during cleaning, and at least once a month and after each use for those respirators designated for emergency use.
- 9** Storage of respirators in convenient, clean and sanitary locations.
- 10** Surveillance of work area conditions and degree of employee exposure (e.g., through air monitoring).
- 11** Regular inspection and evaluation of the continued effectiveness of the program.

For more information on starting a respiratory protection program at your company, visit the OSHA website at www.osha.gov/SLTC/respiratoryprotection/index.html or visit www.cdc.gov/od/ohs/manual/respprot.htm for a detailed view of the Centers for Disease Control/Agency for Toxic Substances and Disease Research's respiratory protection program manual.



Picture courtesy of SEA Group

to use one and who has been given medical clearance to wear one, says Ahlers. He points out respirators that don't fit well can have a leakage rate as high as 30 percent or more. "If a respirator doesn't fit, it doesn't [just] work a little . . . it tends to not work at all," he says.

The effectiveness of the two types of fit testing systems qualitative and quantitative is still up to debate as they are two very different systems.

The qualitative fit test more popular with employers as it is much less expensive and more portable than the quantitative test can be more subjective, as the person being tested may or may not have good olfactory nerves to smell the testing agents (which usually are bitrex, saccharine, isoamyl acetate [banana oil] or irritant smoke, Coats says). The quantitative test, on the other hand, generates a numerical leak rate and is not dependent on an individual's ability to taste or smell anything.

Even though the quantitative fit test is seen as a more accurate form of testing, sometimes investing in the expensive device is not always necessary, according to John Steelneck, project officer of OSHA's Respiratory Protection Program Standard revision. For example, if the respirator wearer only needs a respirator that protects them from dust and mild particles, getting a quantitative fit test will just mean the respirator will pass with a very high number.

"All it will tell you is that you passed and passed very well," he says.

The Life Expectancy of a Cartridge

So, a respiratory protection program has been developed, hazards have been identified, respirators have been chosen based on those hazards and employees have been trained and fit tested and are wearing their respirators. But for how long?

As important as fit testing is knowing when to toss out a respirator or change the cartridge. When clients go to John Hierbaum, MSA's product manager, to buy a respirator, one question always comes up: What is the life expectancy of the cartridges and filters?

"Clients are the least knowledgeable about how long a respirator cartridge should last," he says. "They should understand there is a way to calculate cartridge use."

Respirator manufacturers such as MSA, North Safety, Moldex and 3M just to name a few offer a cartridge life calculator on their websites that compute how long the cartridge will last by asking the user a series of questions. The questions ask about the exposures in the workplace environment and the type of respirators they are using. Ahlers notes that such calculators also on the NIOSH and OSHA Web sites (www.cdc.gov/niosh and www.osha.gov) tend to be conservative, so workers wind up throwing away the cartridge sooner than they actually need to.

According to Hierbaum, it's for their own good. "We always want to err on the side of protecting the worker," he says.

NIOSH is attempting to provide more protection for workers who need to wear respirators and make their lives easier by developing sensors manufacturers can use to notify users when the cartridge is nearing its end of service. Still in the research stages, NIOSH says it plans to distribute sensors to eight respirator manufacturer companies that volunteered to collaborate. The plan is for the manufacturers to integrate the sensors into their own cartridges and for NIOSH to test them to see how well the sensors respond.

Caring for a Respirator

Respirators are only effective when they are properly maintained. Respirator maintenance is a lot like choosing dinnerware. Paper plates serve the same function as the porcelain china, but you will just be able to use them once. Whereas with the china, you have to wash it to use it again, but then it will be as good as new.

Hazardous environments require the use of full-maintenance respirators, such as powered air-purifying respirators and self-contained breathing apparatuses, which tend to be more expensive, last longer and need frequent cleaning. For some situations, disposable respirators or no maintenance respirators such as filtering face pieces, can be worn, but usually should be disposed of after use.

Hierbaum emphasizes when choosing a respirator, it is important not to assume that the more durable one will offer better protection. "All respirators have NIOSH approvals," he says. "It's a 'pay me now or pay me later' type of thing."

When caring for a full-maintenance respirator, Ahler cautions it is important to know the proper procedures for cleaning, as not selecting the proper care method could damage the rubber or other parts of a respirator.

"Almost anything that would clean that respirator up would degrade the way it would work, so it's better to make sure that you have the proper respirator detergent," he says.

The Final Step

No respiratory protection program can be successful if no one is making sure the requirements of the program are followed. In order to make certain that a respiratory protection program is run successfully, Jeffrey Brikner, Moldex's vice president of technical services, suggests implementing a surveillance program to monitor conditions in the different work areas and determine the degree of exposure.

In addition, monitoring the amount of stress placed on employees when using respirators is important, he says, as it will make the employees buy into their workplace program and be more willing to cooperate. They are, after all, the reason why the program is there in the first place, he notes.

"Everything is important when you are talking about anything that affects a worker's respiratory system," says Birkner.

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Why Does The Fire

Technology continues to serve as a driving force for improvements

NFPA Journal®, July/August 2007

The following articles by

Wayne D. Moore

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*July/August 2007 and
September/October
2007*

Each code cycle changes are made to NFPA 72®, *National Fire Alarm Code*®, and many not involved in the process ask why. Some might answer that no code or standard is perfect, but the real answer is that most codes and standards are living documents.

Technology is rapidly changing, as most of us experience daily when we purchase electronic equipment—a digital camera or computer, for example. The technology that drives the fire alarm market is no different. Anyone who had the opportunity to visit the NFPA World Safety Conference and Exposition® in Boston last month experienced first hand the changes in available fire alarm systems technology. Based on the evidence in the marketplace, the Code will always have difficulty keeping up with new technology because the products change so fast! But technology is only one reason the Code may be changed. Three other factors provide reasons for code changes. The first, of course, is fire experience. The second is how the Code is interpreted and enforced by the users of the document; and last are the installation issues that arise from the Code requirement.

As fires and the fire alarm system performance in those fires are reported, it often becomes evident that the Code must change to help ensure systems will perform under real fire conditions. One such change that began in the 1993 Code and was expanded in the 2007 edition of NFPA 72 is the protection of fire alarm control equipment. In 1993, the Code was changed based on fire reports that showed the fire had attacked the fire alarm control equipment before the system responded to the fire condition. The Technical Committee added the requirement for a smoke detector to be located in the area of the fire alarm control unit; if the environment in that location was unsuitable for a smoke detector, a heat detector in the location would be acceptable.

As the Code was enforced, there was some misinterpretation of what the requirement was meant to accomplish. Some AHJs asked that the room where the fire alarm control unit was installed be protected with smoke detectors spaced in accordance with the Code, which often resulted in many additional detectors for that space. As technology changed, some AHJs asked that a smoke detector be installed everywhere there was an addressable monitor or control module installed. In addition, the Code did not give any recognition to those fire alarm control unit locations that were protected by automatic sprinklers.

As a result of these misinterpretations, numer-

ous proposals were made to the Technical Committee to either eliminate the requirement or refine it with clear, enforceable language.

Using the original premise developed by the fire reports used in 1993, the 2007 edition of the Code now requires the following:

4.4.5* Protection of Fire Alarm System. In areas that are not continuously occupied, automatic smoke detection shall be provided at the location of each fire alarm control unit(s), notification appliance circuit power extenders, and supervising station transmitting equipment to provide notification of fire at that location.

Exception No. 1: Where ambient conditions prohibit installation of automatic smoke detection, automatic heat detection shall be permitted.

Exception No. 2: Fully sprinklered buildings shall not require protection in accordance with 4.4.5.

The Technical Committee has addressed the items that relate to the fire alarm control unit that should be protected. But the committee added additional information in the Annex to advise all users of the Code what the committee's intent was and of other issues to consider. One such issue is whether the environment is unsuitable for an electronic smoke detector. If that is the case, it may be unsuitable for electronic control equipment; so the location should be reevaluated for the fire alarm control unit installation. Also, the Annex specifically states "The term fire alarm control unit does not include equipment such as annunciators and addressable devices."

And, finally, the installation issues caused by the Code requirement were also addressed in the Annex with the advice that "Where the area or room containing the control unit is provided with total smoke-detection coverage, additional smoke detection is not required to protect the control unit."

Where total smoke-detection coverage is not provided, the Code intends that only one smoke detector is required at the control unit even when the area of the room would require more than one detector if installed according to the spacing rules in Chapter 5.

The intent of selective coverage is to address the specific location of the equipment." Additional smoke detector placement guidance is also provided in the Annex.

So in the end, the Code changes based not only on technology but also on our experience as the Code is used. Other changes occur when research provides the necessary information to make changes, and those changes will be discussed in the September/October issue.

Alarm Code Change?

Research has a significant influence on changes to NFPA 72

NFPA Journal®, September/October 2007

Each code cycle changes are made to NFPA 72®, *National Fire Alarm Code*®, and many not involved in the process ask why. In our last issue we discussed how fire experience, technology, Code enforcement, and installation issues cause changes in the Code. The other major factor that causes changes in the Code is fire research.

In the 2007 edition of the *National Fire Alarm Code*, two specific issues were addressed and changes to installation requirements were made based on fire research and modeling.

The first change concerned duct smoke detectors. Research sponsored by the Fire Detection Institute and its 2004 report, *Investigation into the Application of Duct Smoke Detectors in Heating, Ventilating and Air Conditioning Systems: Final Report*, was provided to the NFPA Technical Committee on Initiating Devices (Chapter 5).

The research proved the efficacy of duct smoke detectors to perform properly in their application to prevent the re-circulation of smoke by the HVAC system. In addition, the research performed by the University of Maryland and the National Research Council of Canada provided insight that changed the guidance contained in the Code for duct smoke detector installation.

The new guidance for the installation of duct smoke detector sampling tubes is presented in the Annex material to Section 5.16.5.2 of NFPA 72-2007 and provides in part that the "Sampling tubes should be oriented to overcome thermal stratification due to buoyancy of the smoke in the upper half of the duct. This condition occurs where duct velocities are low, buoyancy exceeds flow inertia, or the detector is installed close to the fire compartment. A vertical orientation of sampling tubes overcomes the effects of differential buoyancy.

"Where a detector is installed on a duct serving a single fire compartment, where the buoyancy exceeds the flow inertia of the air in the duct and the sampling tube cannot be oriented vertically, then the effects of thermal stratification can be minimized by locating the detector sampling tube in the upper half of the duct.

"The thermal stratification is not a concern where the detector is installed far from the fire compartment or where the smoke is at or close to the average temperature in the duct."

This represents a radical change in sampling tube installation.

Another significant change in detector installation resulted from the Fire Protection Research Foundation-sponsored program for smoke detector applications and spacing with level beamed and waffle ceilings.

The research resulted in major changes to Section 5.7.3.2.4.2 that states: "for level ceilings the following shall apply:

(1) For ceilings with beam depths of less than 10 percent of the ceiling height (0.1 *H*), smooth ceiling spacing shall be permitted.

(2) For ceilings with beam depths equal to or greater than 10 percent of the ceiling height (0.1 *H*) and beam spacing equal to or greater than 40 percent of the ceiling height (0.4 *H*), spot-type detectors shall be located on the ceiling in each beam pocket.

(3)*For waffle or pan-type ceilings with beams or solid joists no greater than 600mm (24 in) deep and no greater than 3.66m (12 ft) center-to-center spacing, the following shall be permitted:

(a) Smooth ceiling spacing including those provisions permitted for irregular areas in 5.6.5.1.2, substituting 'selected spacing' for 'listed spacing';

(b) Location of spot-type smoke detectors on ceilings or on the bottom of beams.

(4)*For corridors 4.5m (15 ft) in width or less having ceiling beams or solid joists perpendicular to the corridor length, the following shall be permitted:

(a) Smooth ceiling spacing including those provisions permitted for irregular areas in 5.6.5.1.2, substituting 'selected spacing' for 'listed spacing';

(b) Location of spot-type smoke detectors on ceilings, sidewalls, or the bottom of beams or solid joists.

(5) For rooms of 84m² (900 ft²) area or less, only one smoke detector shall be required."

As those who use the Code regularly know, the asterisks shown next to the numbers above indicate explanatory material in Annex A of the Code.

There are additional changes to the Code based on other research, but the above examples show how the process works. Fire research helps to change previously subjective code requirements into valid code requirements supported by facts and actual fire tests.

The leader of current research efforts is the Fire Protection Research Foundation. Kathleen Almand is its executive director. Recently, a project sponsored by the Foundation and conducted by Underwriters Laboratories on Smoke Characterization was completed. It will impact the 2010 edition of the Code. The Foundation's Fire Detection and Alarm Council is also developing new research needs and projects and the Foundation is already in the process of working with the NFPA 72 Technical Committees to determine the priorities of the proposed research that will help direct changes for the 2010 edition of NFPA 72. Copies of completed research program reports can be found at the Research Foundation's page on NFPA's website, www.nfpa.org. **APF**

Wayne D. Moore, P.E., FSFPE is a principal with Hughes Associates and immediate past chair of the NFPA 72 Technical Correlating Committee.

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By William Ball

Applications and
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For many individuals the most dangerous part of their workday is the commute to and from their place of employment. But for some, this is just one hazard faced during any given workday. People that have to enter and work in confined spaces as part of their job face deadly occupational hazards each and every day.

The National Institute for Occupational Safety and Health (NIOSH) estimate that millions of workers globally may be exposed to hazards in confined spaces, and every year a large number of those workers become workplace fatality statistics. Those killed include not only the individuals working in a confined space, but frequently those who attempt to rescue them. Confined spaces are encountered in a wide variety of industries including mining, construction, water and sewer operations, agriculture and farming, oil and gas, petrochemical, shipping and aircraft maintenance. Sewers, underground cable vaults, tanks/vessels, silos, and aircraft wings are easily identified as confined spaces. Others may not be so obvious, for example open topped chambers, vats, manure pits, unventilated, or poorly ventilated rooms.

In July 2007, tragedy struck a dairy farm in Bridgewater, Virginia. While attempting to transfer manure from a small pit to a larger one, the pipe transferring the manure became clogged and the

farmer climbed into the pit to unclog the blockage. "It was probably something he had done a hundred times," a friend said. "There was gas in there and he immediately succumbed." Emergency workers who responded to the scene speculate that a farmhand climbed in to rescue his employer and he too collapsed. Unfortunately the farmer's wife and two daughters also perished in would be rescue attempts. Five people died that day, four from the same family, four would be rescuers. Regardless of how obvious a confined space may or may not be, the consequences of failing to recognize the potential hazards can be fatal.

Atmospheric hazards are the number one cause of fatalities in confined spaces, however other hazards such as mechanical equipment with moving parts, engulfment and slips and falls must also be taken into consideration. Most confined space accidents can be attributed to ignorance of the hazard potential.

Since most atmospheric hazards are imperceptible



to human senses it is necessary to assess the confined space atmosphere with an appropriate electronic gas detector. The least favourable conditions should be assumed to exist during every confined space entry. The possibility of explosion, poisoning and asphyxiation cannot be ignored.

Atmospheric hazards to be aware of are oxygen depletion, or enrichment, toxic/poisonous and combustible gases. These conditions may be present prior to entry, or they can arise suddenly any time during occupation of the confined space. Often work being performed in a confined space, or activity near confined spaces can contribute to changes in atmospheric conditions.

In Oakville, Ontario last June, two experienced workers were killed in a sewer where they were pulling telecommunications wiring. At point of entry, the atmosphere had been tested and declared safe, but only 6 metres into the sewer both men collapsed. The Oakville Fire Department performed a rope rescue. Once on the surface, neither victim displayed vital signs. The investigation is ongoing, but initial air quality testing revealed the oxygen levels were too low to support life. Authorities suspect that a gas from an external source displaced the normal air. The story did not say whether the workers were wearing any personal gas detectors and investigation results have not been published. This incident illustrates that atmospheric conditions in a confined space can quickly become deadly, emphasizing the need for continuous personal monitoring.

If at all possible, confined spaces should not be entered. If entry is unavoidable, then prior to any confined space entry a number of details must be considered, such as access and egress routes; restricted areas within the space; atmospheric, physical and mechanical hazards that may be present; the work to be performed; the number of people that will be involved; ventilation requirements; initial interrogation and continuous

monitoring of the atmosphere; escape and rescue plans. Confined spaces are dangerous places. Proper planning and training is integral to staying safe.

Once the atmospheric risks have been assessed, always use an appropriate gas detector to monitor the environment. A basic understanding of the gases that could be encountered and the hazards they present is essential. The majority of confined space entries involve interrogating the atmosphere for oxygen concentration, toxic contaminants and combustible gases. The most common configuration in a portable gas detector used for routine confined space entry includes oxygen, combustible (%LEL), hydrogen sulphide and carbon monoxide sensors. But not all applications are the same and the types of sensors selected should reflect the known and potential atmospheric hazards associated with the confined space. For broad range detection of toxic contaminants add a photoionization (PID) detector or a metal oxide semiconductor sensor (MOS). For the detection of carbon dioxide or combustible gases in anaerobic environments add an appropriate non-dispersive infrared sensor. Many detectors available today offer a wide selection of sensor possibilities to provide additional worker protection. Since confined space entry is the largest single market for portable gas detectors, gas detection manufacturers put huge emphasis on developing products for this application and there are various options available for consideration when selecting a monitor to suit your needs.

How to obtain a sample from the confined space atmosphere to determine whether or not it is safe to enter is a key consideration. All gases have a vapour density and in comparison to normal air, some gases are heavier than air, some are lighter and some have a comparable density. Based on vapour density, gases in a confined space will stratify so obtaining a representative sample at various levels prior to entry is important. For example, the combustible gas methane is lighter than air and tends to collect in pockets at the top of a space. Oxygen of course is a component of air and can be found at all levels. Carbon monoxide is relatively close to the density of air and can also be encountered at all levels. Hydrogen sulphide is heavier than air and tends to collect at the bottom. Sampling at the ceiling, mid-height and bottom of a confined space must be done before an "all clear" for entry can be declared.

Obtaining a representative air sample from a confined space can be achieved by different methods. The most primitive method still in use is actually lowering a portable detector into the space on a rope, retrieving it and checking peak readings. But detectors can be physically damaged if they swing against walls, hit a ladder wrung or come into contact with water or muck at the bottom. Currently remote sample draw systems are more commonly used for obtaining "pick hole" samples before opening a confined space cover and for sampling the atmosphere at a specific point or level. Two types of remote sample draw systems are generally available, motorized pump and manual hand aspirated squeeze bulb. Manually aspirated squeeze bulbs with attached tubing enable the user to bring the sample to the sensors. This method can be quite arduous and it can take a large number of squeezes to properly assess the

hazard. The motorized pump provides the easiest method for drawing a sample from a remote location. Motorized pumps can be integral or external to the portable safety gas detection instrument.

The sensors in a portable safety gas detector can only detect gases that actually reach the sensors. In order for an instrument to accurately determine the concentration of oxygen and other contaminant gases that may be present in a confined space, the sample must first reach the sensors and enough time must be allowed for the sensors to fully stabilize their readings. Whatever remote sampling technique is employed be sure to follow the manufacturer's instructions. Any failure in the sample draw system such as leakage, pump failure, improper assembly or absorbance of contaminants in the system being used can lead to dangerously inaccurate readings. Since most failure modes will produce readings that are lower than actual concentration, proper testing of the sample draw system is critical.

Once a confined space has been declared safe and workers enter that space it is essential to continue monitoring the atmosphere continuously. Ideally each worker in a confined space should be outfitted with a personal multi-gas detector as part of their everyday personal protective equipment (PPE). Many gas detection manufacturers devote a significant portion of their research and



Any failure in the sample draw system such as leakage, pump failure, improper assembly or absorbance of contaminants in the system being used can lead to dangerously inaccurate readings.

development dollars to the development of smaller, less expensive personal detectors. Workers in confined spaces are often encumbered with a lot of PPE. Today there are standard 4-gas detectors available that are extremely compact and lightweight. The smaller the detector, the less likely there will be employee opposition to donning yet another piece of protective equipment. And with lower pricing in the market, it is more affordable for employers to protect employees facing atmospheric gas hazards. The ideal confined space gas detection package would include an appropriate multi-gas detector with either a built in or external motorized pump for initial interrogation and sentry monitoring, and individual small, lightweight diffusion multi-gas detectors for each employee.

The use of personal gas detectors is primarily driven by legislation and regulations. Many countries have regulations demanding the use of detectors in confined space applications. Fortunately even without regulations many employers recognize that worker safety is a priority. Times have changed and workers cannot be treated as they have been in the past. In Canada the federal government introduced Bill C-45, new legislation that is part of the Criminal Code of Canada. Under the new law, individuals, and organizations can be held liable for occupational health and safety offences. Bill C-45 states:

Everyone who undertakes, or has the authority,

to direct how another person does work or performs a task is under a legal duty to take reasonable steps to prevent bodily harm to that person, or any other person, arising from that work or task.

The corporate director, chief executive officer and chief financial officer can be held accountable, and persecuted for offences. The penalty for conviction of occupational health and safety offences under the Criminal Code can be as severe as life in prison.

Currently countries such as India and China have a large need for personal gas detection products. As these emerging economies develop occupational health and safety regulations, the demand for protective equipment will continue to increase for quite some time. China has a population of 1.3 billion with approximately 700 million in the active work force. According to Chinese government estimates, approximately 200 million workers are potentially exposed to industrial workplace hazards. The Chinese government is currently developing regulations for occupational exposure limits. The potential in these large markets will continue to fuel research and development of new personal safety gas detection technologies.

In more mature safety markets the effect of increased safety awareness is providing positive results. According to the U.S. Department of Labour, industrial fatalities in 2006 were at the lowest rate since the fatality census began in 1992. In 1992 the number of fatal work injuries per 100,000 workers was 5.2; in 2006 the figure is down to 3.9. In Britain the same trend in workplace fatalities is evident. Since the introduction of the Health and Safety at Work Act in 1974 work related deaths have decreased approximately 35%. In 2005/2006 the number of fatalities is at the lowest level ever recorded. Fewer fatalities are the result of increased awareness and improved safety practices. The challenge now is to maintain this downward trend.

Most confined space deaths that result from exposure to lethal atmospheric conditions could have been prevented with proper training and the implementation of safe confined space entry procedures. Ignorance and complacency are deadly ingredients when it comes to workplace safety. Be safe and be aware. Don't become an industrial fatality statistic.

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Research & Development drives PPE innovation

How it all started

The United Kingdom is widely recognised globally as having some of the world's best manufacturers of firefighter PPE. And not without good reason. In the early 1980's it was literally a case of "necessity being the mother of invention" when one major fire disaster in London's underground network, which tragically saw the deaths of 31 people including one firefighter, with others injured, brought home the lack of protection provided by the tunics then worn routinely by our municipal firefighters.

By Paul Gibson

Regional Export Sales
Manager, Bristol
Uniforms

The King's Cross tube station fire 1987 highlighted the inadequacy of woollen tunics and pvc "wetlegs" trousers as they failed to provide adequate protection against the fierce underground heat and flames which characterised this incident. In 1988 the A26 Home Office specification ushered in the first designs and combinations which are the basis of today's firefighter PPE ensembles. Bristol Uniforms was actively involved in developing both the earlier A19 and then the A26 Home Office specifications and began what was to become a long involvement in the development of new garments, fabric combinations and today's national and international standards which have their origins in these early specifications.

The virtuous circle

New product development and the research that lies behind, or precedes it, is part of the virtuous circle of innovation built around the needs of the customer. Whilst necessity was undoubtedly the mother of invention back in the 1980's much of the progress which has been made over the past 20 years or more has resulted from the close working relationships between the PPE manufacturer and the customer, on the one hand, and the PPE manufacturer and the fibre and fabric manufacturers on the other.

Careful monitoring of the performance of firefighter garments has helped to identify desirable performance improvements in terms of flame and



water protection, moisture vapour permeability and wearability as well as the need to constantly look at ways of improving the compatibility of various elements of PPE when worn in combination.

The role of fibre and fabric manufacturers

A robust and efficient supply chain committed to meeting the needs of the specialist PPE market is essential for the smooth working and international competitiveness of the UK's firefighter PPE manufacturing sector which has worked closely with both the fibre producers and fabric weavers for many years. This close cooperation has led to an unrivalled understanding and appreciation of each other's needs within a supply chain which is also recognised as one of the most highly developed anywhere in the world today.

The chain begins with the world's leading fibre producers which are, in the case of firefighter PPE, Dupont, PBI Performance Products Incorporated and Kermel. These companies in turn supply directly, or indirectly through yarn spinners, the leading fabric weavers including A W Hainsworth & Sons Ltd and Heathcoat Fabrics Ltd in the UK.

The origins of this supply chain collaboration lie in the pioneering work undertaken by Bristol Uniforms as early as the 1960s and further developed in the mid 1970s when discussions between Bristol and Dupont led to the introduction of the first Nomex outershell product in 1980. Named Nomex III, it was introduced by Bristol Uniforms to the fire market and was made from a 265gsm blend of 95% Nomex fibre and 5% Kevlar. This was followed by Nomex Delta T, a 195gsm blend of 75% Nomex fibre, 23% Kevlar and 2% antistatic, in 1990. During the 1990s Delta T steadily superseded Nomex 3 and became one of the leading outershell fabrics throughout Europe.

In 2000 Hainsworths introduced their current class leading fabric, Nomex with Ti-Technology. This is an entirely new construction with a weight of 220gsm and uses a dual layer advanced woven fabric system with a 95% Nomex and 5% Kevlar outershell interlocked with a 100% Kevlar grid on the inner side. Differential shrinkage of the two layers is accommodated by the bonding process of the layers using a Nomex fibre yarn providing improved wearer protection against heat from flash fires. Bristol was the first firefighter PPE manufacturer to introduce these fabrics into their garments.

In the mid 1990s Heathcoats entered the market

to supply outershell fabrics for firefighter garments. By using PBI fibres from PBI Performance Products Incorporated which accept dyes, the company has been active in the development of colour variations to PBI Gold, the natural colour. In recent years both navy and red have been made available for new PPE introduced by Bristol.

The characteristics of today's major fibres used in fabric combinations have been available for some years. This has allowed the fabric weavers the scope to apply their technological and design skills to the development of new constructions which have become available to the manufacturer for firefighter PPE applications. Over time, the improved understanding of fibre performance has made possible the development of different weave ratios to give improved performance.

WL Gore & Associates are a leading membrane manufacturer supplying the intermediate layer which provides the thermal and moisture barrier within the garment construction. Products such as GORE-TEX® Laminate with AIRLOCK® Spacer Technology, GORE-TEX® Fireblocker Laminate and Crosstech® Laminates form a range of membranes developed specially for fire garment use and provide high performance protection. Gore use a blended aramid substrate to provide strength in their non-woven constructions.

Finally each garment has an inner lining. A number of companies, mainly French and German, manufacture firefighter garment linings. Using principally aramid fibres, the linings are normally supplied through specialist quilters before arriving at the garment manufacturer.

The garment manufacturer's role – bringing it all together

The contribution of the garment manufacturer in the performance and comfort of the final product is a combination of a number of things including;

- Selection of the best individual layers which in combination deliver the right technical and comfort characteristics
- The knowledge and skills required to design the combinations so that they can be brought together without compromising the performance of any individual component
- Accuracy of measurement in fabric cutting combined with skilled machining to produce durable and well-finished garments
- Attention to detail in garment sizing to ensure good fit and wearer comfort for both male and female users
- Careful selection of trim and finishes to achieve the specified in-service performance of the user
- Manufacturing methods which result in garments which are not only durable but have the required longevity to undergo regular maintenance under a managed care programme which involves frequent washing and drying as well as periodic decontamination, depending on service exposure experience.

All firefighter PPE is required to meet one or more national, European or international standards. The most widely specified throughout Europe and many other parts of the world is EN 469:2005 and garment design must ensure that in combination the layers of fabric perform under test to meet or exceed the required levels of protection against flame, heat, water penetration and breathability.

Firefighter garments include not only fire coats and trousers but also gloves, boots, flash-hoods, helmets and underwear. These all need to work effectively in combination and the fire coat and trouser manufacturer has a responsibility to ensure compatibility between these and the other PPE to afford flexibility of choice for users between a

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number of options available to them. Bristol Uniforms has a special department whose role is not only to undertake individual wearer sizing but to run garment compatibility tests with whatever other PPE the fire service personnel are supplied with.

Wearer trials – compiling empirical evidence

Firefighter garments are deemed fit for purpose provided they fulfil requirements in the two key areas of technical performance (protection) and wearability (user comfort).

Technical performance is achieved through the skill and knowledge of the product designer supported by independent physical tests which allow product certification to specified standards. Organisations like the British Textile Technology Group (BTG) are certified independent test houses to which manufacturers will submit garments for test against a series of physical strength and behavioural test criteria and to achieve certification to the appropriate standard.

Garment performance in fire situations is measured using computer monitored manikins in which fire garments are fitted to glass epoxy body models fitted with heat sensors. These sensors are linked to a computer with a special programme which measures and records the surface temperature at many points around the body to ensure that the tested garment meets the level of heat and flame protection required.

Whilst machines and computers can provide accurate testing of physical properties, physiological response and wearer comfort still require the involvement of human beings.

In 2003 Bristol Uniforms, as part of its ongoing research and development, set up and undertook a series of wearer trials at Birmingham University over the space of a week during which a team of volunteers from the ranks of regular firefighters from the Midlands took part. These trials focused not on the protective qualities of the garments but their physiological impact on the wearer. Specifically the core tests were designed to measure levels of heat stress under prolonged wear of different fabric combinations as part of Bristol's programme to introduce new designs which would be lighter and more flexible. Independently conducted by Human Vertex Ltd, the trials included extended treadmill exercises during which a computer programme was used to convert body sensor information on breathing and heart rates, body core temperature and sweat rates.

The trials also included ergonomic tests on the firefighters whilst climbing, crawling and wearing breathing apparatus. These were used to assess the impact of activities frequently experienced by firefighters in everyday real life situations and also included donning and doffing of the kit. These blind tests by the wearers were used to indicate levels of wearer comfort on the different garments.

Investment in new product development

The investment in research provided a combination of scientific and objective results which were used extensively in refining product design and development. They made a substantial contribution to, and were a major component in supporting, the Ergotech™ and Ergotech Action™ design programmes which saw the introduction of the first lighterweight garment constructions which have been progressively adopted by fire & rescue services across the UK and increasingly in other EU countries.

Since then the work undertaken during that test programme has been used in other product development programmes including those for new urban search and rescue (USAR) and wildland firefighting PPE.

Firebuy's Integrated Clothing Project

The value of manufacturer led research and development, coupled to close collaborative working with key players in the supply chain, can be seen in the results achieved following the introduction of improved garment design as well as the levels of adoption of UK manufactured PPE throughout Europe and other parts of the world.

In the UK Government's Integrated Clothing Project tendering process, begun in 2003, tenderers were required to demonstrate the performance of their product offerings in a wide range of tests covering design and aesthetics to physical performance and durability. Amongst these tests were wearer physiological response trials which for Bristol, having already undertaken similar work previously, helped to further underline the value of independent research in successful new product development programmes.

Remaining competitive in world markets

A robust and demanding home market is undoubtedly one of the keys to the UK's success in world markets. Another is the central role that the UK has played from the earliest beginnings in shaping performance standards – first with the UK government's Home Office in the 1970's, then through the work of the BSI standards committees and then, in turn, the BSI's influence on European standards bodies – an influence which is still felt strongly today.

However, as any global player will attest to, success internationally depends on more than the ability to meet required standards. A global presence in the PPE market will always be a major driver of an individual company's R&D strategy. This transcends any government involvement in regulating or influencing public sector behaviour in individual countries and any purchasing policies which result will have only a limited impact on companies' R&D programmes. Products will continue to be designed to satisfy international standards and meet the needs of global markets to remain competitive. Bristol will continue to invest in new product designs working collaboratively with fibre and fabric manufacturers to produce world class products and help to maintain the UK's leading international position in the manufacture and supply of firefighter PPE.

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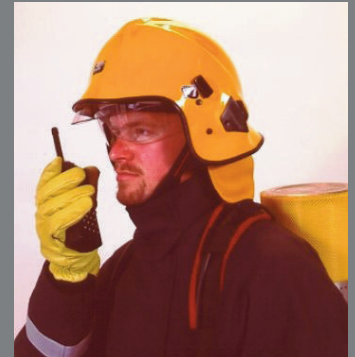
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Complexity/ Regularity Paradigm in Rescue

Rescuers around the world are daily faced with different types of rescue situations. The frequency of these different rescues types has a lot to do with the risks present in a given geographical area of responsibility. As an example, a rescue department close to a major motorway may well have to deal with a large number of high-speed crashes. Whereas a rescue team located in an industrial area may be more familiar with industrial type accidents commonly found in light industry.

By Brendon Morris

Technical Rescue
Consultation and
Training Manager,
Holmatro Rescue
Equipment

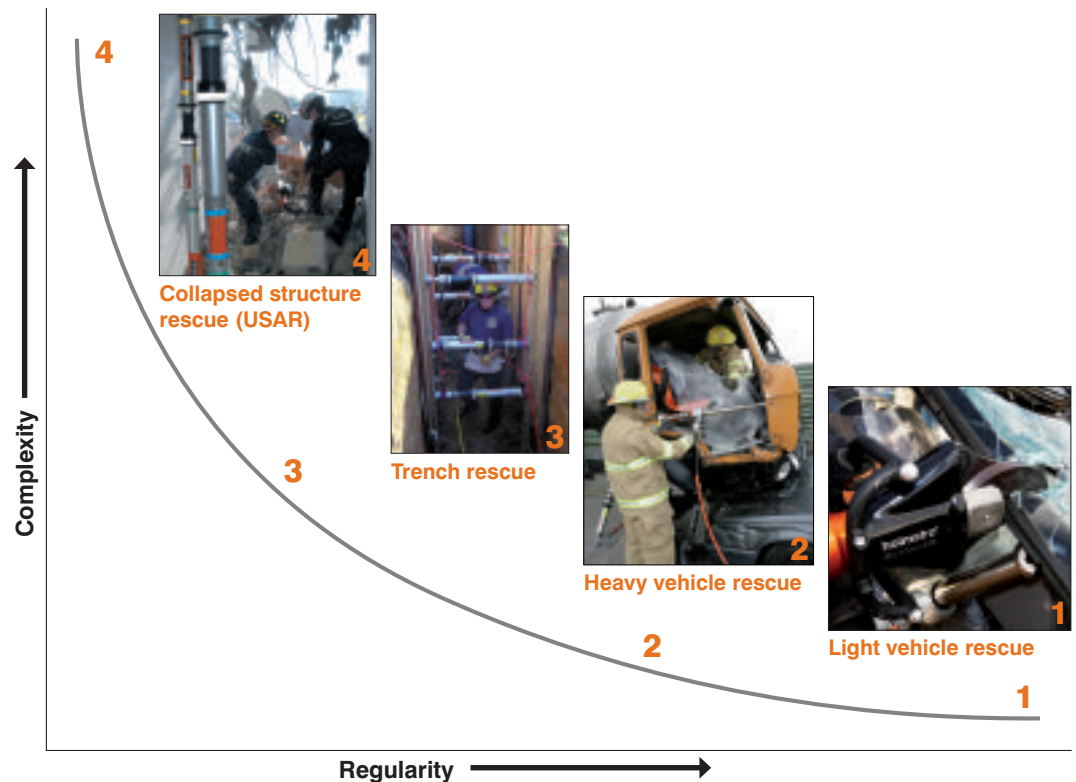
Deeper investigation into the different types of rescue situations faced by a “typical” rescue department shows an interesting relation between the regularity and complexity of the different rescue types seen. In most cases there is an inverse relation between the complexity and regularity of different rescue situations (figure 1). In other words, the more common a rescue type is, the less complex it usually is. Inversely, the less common a rescue situation is the more complex it normally is.

Let us for instance make a comparison between two different extrication rescue situations. On one side of the paradigm we will use a light motor vehicle extrication. Extrication of persons trapped in regular passenger cars is in many instances the

most common rescue discipline performed by the “typical” rescue teams. At the same time this discipline is not generally considered as a very complex affair. On the other side of the paradigm we could see collapsed structure rescue, commonly referred to as Urban Search and Rescue (USAR). Building collapse is in most cases not often encountered by the average rescue team. In terms of complexity we also know that in comparison to light vehicle extrication, USAR is usually considered to be more complex.

The most pronounced implication of the relation between complexity and regularity is its affect on rescue ability. Rescue activities in the high regularity/low complexity realm (low on the curve)

Figure 1. The relation between the complexity and regularity of different types of rescue situations



usually represent disciplines where a higher level of ability among rescuers exist. This is not complex to understand, as these are the types of rescues frequently dealt with by rescuers and generally not that complex to deal with. The problem arises with the rescue types that can be found in the high complexity/low regularity area of our paradigm (high on the curve). These rescue activities present the rescuer with difficult and complex situations with the added disadvantage that those involved will not usually have been exposed to similar events in the recent past (or perhaps ever).

The result is that rescue teams find themselves very competent in dealing with the majority of the rescue events they have responsibility for, but that they are, at the same time, not very well prepared for those incidents classified high on the complexity/regularity curve. So what are some of the

actions that can be taken to counteract the weaknesses highlighted by this paradigm? In most cases countermeasures to these weaknesses can best be found under the headings of training, staffing and equipment.

Training, as in so many cases holds many of the answers. The first question to consider is whether or not rescue teams should focus their training on the rescue disciplines in the high complexity/low regularity categories (high on the curve) or on those in the as low complexity/high regularity area (low on the curve). This may seem easy to answer, with the need for high-quality training in more complex/less regularly seen rescue situations appearing quite logical. The proper training focus however, must consider how teams are staffed. In other words, if one has a specialized team responsible for high complexity/low regularity type

incidents, then the need for training time on these topics may be different compared to the training needs of other teams. On the flipside however, a "one team" type approach (often seen in smaller rescue services), where rescuers are expected to be able to perform a variety of different technical disciplines, calls for the need to invest in training in the high complexity/low regularity disciplines to ensure success. At the same time the need to invest in honing skills used in the more "everyday" type of rescues may be highly desirable too.

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has a dramatic influence on the training and staffing needs when considering the regularity/complexity paradigm. In most cases the best bet for rescue teams is to choose equipment that can be applied *across* this paradigm. In this case teams do not have to deal with unfamiliar rescue tools only used in the more complex/less regular incidents. By selecting equipment that can be deployed in different forms across the complexity/regularity paradigm, one provides for better familiarity with it. This can be very valuable when the equipment needs to be used under the stressful conditions of a highly complex incident.

Much fumbling and confusion can be avoided through a wise choice of equipment that can be well applied across this paradigm. Consider for instance a well designed emergency shoring



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system. Such a system will be able to be used in a variety of emergency shoring applications across the complexity/regularity paradigm. It can be utilized in as simple a situation as a light motor vehicle on its side through to the stabilization of collapsed structures. These kinds of systems make good sense when considering the rescue requirements attached to such a wide diversity of situations.

In some cases, rescue teams choose simple stabilization systems whose application possibilities are limited to simple high regularity light vehicle rescues. The problem with this approach is that rescuers become very familiar with these systems (in itself not an issue), but when faced with a more complex/less regular event then suddenly have to use more advanced systems they have not much experience with. It may seem a little over the top to use a shoring system with a hydraulic lifting capacity to simply stabilize a car on its roof. However, when this same system can be used to stabilize and, where necessary, lift a heavy goods vehicle in a car under-run situation, it suddenly makes a lot more sense.

In conclusion, we see that the effect of high complexity/low regularity type incidents cannot be ignored. This is especially true when considering the training, staffing and equipment considerations surrounding them. Simply focusing on the low complexity/high regularity (low on the curve) type events may well provide short term gains, but eventually will lead to decreased efficiency and effectiveness of the "typical" rescue team. **APF**

Brendon Morris has been the Technical Rescue Consultation and Training Manager at Holmatro Rescue Equipment, based in the Netherlands, since 2001. Before this he worked in the emergency services of South Africa and, as a lecturer, at the Durban University of Technology, Department of Emergency Medical Care and Rescue.

Brendon is actively involved in the provision of consultation and training to emergency service departments around the world. In the last years he has consulted to no less than 40 different countries' emergency services in the field.

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Various applications for Thermal Imaging in the Fire Industry

Fire Fighting

Since the first thermal imaging cameras (tics) were used by the fire service many alterations to both the technology and the attitude towards such technology have taken place.

By James Brooks

GB Solo Ltd.

The first cameras were restricted in their definition, their overall size and most importantly their inability to view hot scenes (such as a fire) without 'whitening out'.

However, it was these first cameras which defined the predominant role for the tic within the fire service ever since.

As a rule, these cameras were used for search and rescue within the fire scene but their size and weight did not lend too kindly to prolonged use and with these issues the first tics did well because they were the first and nothing better was available at that time.

With the improvements in technology this meant that the overall size, shape of the tic could be more 'manageable' as a hand held search and rescue tool and with the predetermined search and rescue layout already set by the earlier tics it has

taken some time to see tics used in different roles.

The thermal image camera is designed to be used in hostile conditions and highlight infra red radiation details from surfaces with varying temperature. This equipment can aid in the search for casualties within densely smoke logged areas and determine the location of hot spots during a fire situation.

Once the seat of the fire has been extinguished, the tic can be used to check if any hotspots are left which might cause re-ignition.

Tics are being used more and more in aftermath appraisal for inspections of affected property and neighbouring houses which may have been affected by more than just smoke damage. These inspections help to reduce the amount of time fire crews are out on calls and this use led the technology further in to tics with telemetry;

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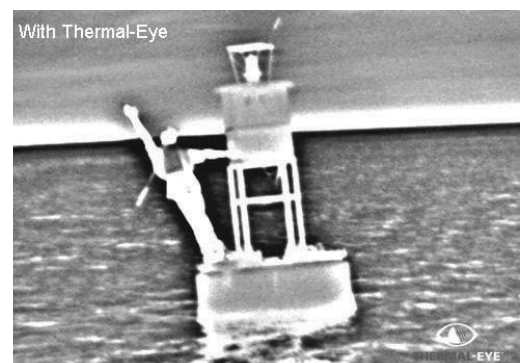
Thermal imaging cameras may also provide useful information for fire investigation.

With some tics now having the ability to record and download digital quality pictures – some units can even store up to 40,000 images – the usefulness of a tic extends beyond the fire ground and into the forensic field. With the use of pictures taken shortly after a fire had been controlled, the forensic team can begin to gather information crucial to determining the cause, tics can register temperature differences down to 0.01 degrees and as such can determine much more than the naked eye.

Following RTA's on many occasions the fire service are presented with situations contained at the scene and beyond. At the scene of the RTA fuel spills and inspection of cylinders for internal heating invisible to the naked eye combined with heat sources also outside the realm of the human eye are easily visible to the tic.

From the scene of the RTA, casualties can be separated from their vehicles through either disorientation, shock or on some occasions they can be separated due to forces experienced on impact. Through all scenarios, the tic can highlight casualties wandering as far as two hundred metres from their vehicle. All of these features are only possible with the use of a tic.

The fire service is also called out to deal with casualties lost on beach flats and on occasion mountainous terrain. The parameters for the FIRE





tic to be a successful tool on these occasions are based on the distances it will be required to view. Most FIRE tics have a usable range on such occasions of man detection approximately 100-200 metres. More often than not, the distances the user requires to scan range into kilometres and as such more specialised search and rescue tics are required with larger lens, zoom features and different software calibrations.

Seeking casualties among collapsed building scenarios has become a more realistic reality since 9/11 but there have been widespread earthquakes around the World which have seen the use of the fire tic as a first responder search tool. As a first responder the tic can again highlight potential casualties and possible explosive/flammable possibilities. The reality again is that there are smaller, less robust tics designed purposely for such scenarios. The purpose built tics have telescopic attachments with 360-degree adjustability and the ability to get into the areas where the casualties often are located.

Although the majority of tics mounted to urban airborne reconnaissance units are used in the detection of car thieves or criminals hiding in a back garden somewhere, they actually can have a real and beneficial effect on a fire ground control.

These units have been used to monitor fire grounds from industrial to urban and their detection of ceiling temperatures, structural integrity



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along with potential hazards from above have often proved critical to the safety of the ground crew. Fuel depot and industrial site fires have highlighted an area where information gathered from the relative safe distance of the airborne unit can provide information to be used as a scenario overview. They can highlight with immediacy areas to perform safe fire suppression and areas to avoid, along with adding to the search for casualties from the birds eye. The ability to remotely monitor changing temperatures on potentially explosive material has proven to help save fire crews lives.

The use of tics on board ships is ten fold. As a fire fighting search and rescue unit, performing searches for casualties within confined areas such as cabins, corridors, and auditoriums which can now boast over 1,500 seats the tic is the first and only responder as out at sea there will be no fire service there to help. Other uses within a fire fight scenario include searching for hotspots behind bulkheads as this task cannot be carried out with any other tool. In locating the seat of the fire quickly a ship stands more realistic chance of containing the situation and keeping the vessel operational to make land.

With the more modern cruise liners and ferries being manufactured top side from aluminium to save on top end weight and for this reason the tic has more emphasis on fire location as aluminium burns ferociously. Again, the major emphasis must be to contain any fire, perform search and rescue of casualties and make land. Fire crews often consist of a mixture on skills levels from highly trained individual down to under trained personnel and for this reason the tics on board must be effective yet as straightforward to use as possible. The tics also have to have readily rechargeable batteries, speedy method to locate the batteries within the unit and reliability based around the US Navy spec units.

Other than fire fighting search and rescue, the tic takes on many roles being used to monitor engine rooms, electrical sub stations and specialist tics for man over board and anti piracy issues which many ships now face on a daily occurrence. The tics used for anti piracy/man overboard situations are more specialist as suggested above in that they can locate potential casualties or threats over kilometres. These tics are very often mounted to pan and tilt platforms and operated from the bridge, however there are hand held units also in the field performing these tasks.

Whilst the technology of tics has developed rapidly within the fire market and the initial reason for purchasing a tic remain similar now as then.

Other more expansive uses and technologies will always come in to play offering more telemetry, less size, less price and greater definitions however, it will always be the more imaginative jobs which catch the eye for uses of tics.

Fire fighters in the US are called out to use their tics to more than 300 lost pet searches each year, while fire crews in Europe have been called out to help search for and talk down suicide threats from high bridges and tower blocks. One Fire crew in the US was called out by the police department to help them identify an object which had become lodged in the vent stack of the heating system for a shopping arcade. From the external pictures taken using the tic a distinct area of heat conducting through the stack was visible. The fire crew performed confined space search and were able to inform the police that in fact it was a man stuck in the stack. The man had stolen cash and goods from a jewellery store within the arcade two nights previous to his discovery!

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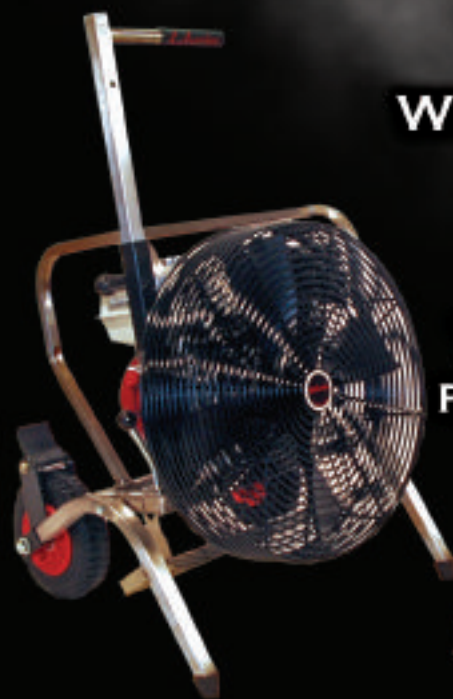
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The Nuts and Bolts of Quality Training

By **Mitch C. Baclawski**

Fire Science Academy,
University of Nevada,
Reno

Nuts and Bolts – the common hinge to many mechanical and not-so-mechanical apparatuses. Training instructors – the common hinge to hazardous material/emergency responders and other occupational adult learners. Put the two together and you have the Nuts and Bolts of Quality Training.

There are many quality works on using adult learning methodologies to teach hazardous materials workers and emergency responders. Many of these works have excellent, although extensive descriptions. In this article I would like to provide a short and easily usable version that can be assessed and applied to various training programs – the nuts and bolts of quality training.

By emphasizing the principles of adult education, trainers should be able to integrate new training technologies and techniques into their programs, improve annual refresher training, and increase the effectiveness of their courses.

Applying the principles described here to the development and delivery of training programs should ensure the programs are excellent and provide the best possible basis for working in hazardous environments in a safe and healthful manner.

Program Characteristics

The best training programs include the following characteristics: Accuracy; Credibility; Comprehensiveness; Clarity; and Practicality. An emotional link to the students should be made and they should also perceive the subject matter as rational.

Accuracy can be ensured by requiring that the training materials are prepared and reviewed by qualified individuals, updated on a periodic basis, and applied by qualified and experienced individuals employing appropriate training techniques and methods.

Employing educational methods appropriate to adult learners is particularly important for the high-hazard work environment. **Credibility** is enhanced when instructional staff is experienced in applying the knowledge and skills that they are teaching, and establishing a “peer” relationship with the trainee. In other words, the instructors must have walked a mile in the students’ shoes.

Picture courtesy of
FEMA Photo Library,
Win Henderson
photographer



Excellent programs often include “reality check” learning activities that give trainees the continuing opportunity to measure the relevance of the training against their own personal experiences. In my opinion, realistic hands-on practical exercises provide the best “reality check.”

Training programs must be **comprehensive** and cover everything required for someone to work safely in the industry; a requirement that is particularly critical for working with hazardous materials. Incomplete information or failing to make sure that the trainee has mastered the minimum necessary knowledge and skills can be dangerous to all. Any training under the HAZMAT standard should aim to be comprehensive rather than simply meeting the minimum number of training hours specified in the standard.

Training programs must not only be accurate, believable, and comprehensive, they must also be **clear**. If the material is understandable only by someone with a Ph.D., then the program will be less than successful. Training materials should be written in the language of everyday speech for the target audience. Further, training material should accommodate a range of different literacy levels and learning styles as discussed in the *Principles of Adult Learning* section below.

By presenting information, ideas, and skills that students see as directly useful they will find the training programs to be **practical**. This practicality can be enhanced by involving, when possible, the audience or other peers in the development of the program.

Adult learners will be more engaged and better able to use the training if it makes sense to them. Make the training **rational** by doing your home-

work when developing the program. When possible, involve the students in finding out the effect this training may have on their work. How does this training add to or subtract from their work? What are the advantages or detractors of this training? During the training, acknowledge those who assisted in the development. Ask the students often if what is being presented is making sense.

Recognize that students have various expectations about the training and plan to satisfy this need. This will create an **emotional** link with the student. Exactly what this need is will be different from student to student. For some students it may be as easy as offering light refreshments in the classroom, others, the certificate of completion, and for others, it may be the internal or external recognition of completing the next level of training. It is also appropriate to highlight the importance of the training through your marketing efforts. Positive promotion of the training should communicate the training is going to give the student something they do not already have. This can be in the form of flyers, posters, email announcements, newsletters, Web pages or banners. To reinforce the power of emotional appeal, try this the next time you see a TV commercial: take a popular commercial, apply some critical observation skill, and then ask yourself, “Are they selling the product?” or “How much better will I be if I have or use this product?” Use emotional appeal in marketing the training to the students and others, in and out of the classroom.

As trainers we are all probably familiar with the notion of *you remember 10% of what you read and 90% of what you do*. Although there is controversy about the validity of these numbers,

they do remind us that the best training programs have a **physical** element. People learn best by doing, especially when learning in the environment the student will actually work in. In the case of HAZMAT training, responders expected to perform at night, with limited tools, in environments requiring Level A protection should train in this same type of environment. They should also train within the administrative environment in which they are expected to perform. The students should experience the same level of management support and importance in the workplace that they are taught during the training.

Principles of Adult Learning

Adult education is empowering because of the experience adults gain in educational programs. The vast majority of HAZMAT students are adults who already possess the knowledge, skills, and abilities to work in their current occupations such as firefighters, police, emergency medical responders, petrochemical process operators, and transportation workers. The objective of HAZMAT training is to provide the additional knowledge, skills, and abilities to permit these workers to safely perform their trade in high-hazard environments. Achieving this requires instructional materials, techniques, staff, and appropriate training environments fit to the target audience and based on proven principles of adult education. The following are the basic principles of adult education that can be applied to HAZMAT and related training programs:

- Adults learn best by doing. Knowledge alone is insufficient in the HAZMAT environment. Workers must also be competent and proficient in the unique skills that are required in such work. Realistic hands-on training exercises and skill checks are essential.
- Adult learners respond better when they have the opportunity to learn from their peers. At the Fire Science Academy we recognize the critical importance of peer instructors. In general, the instructors who are experienced responders are received much more favorably than those with only academic credentials.
- Adults learn from a variety of learning activities. Employ role playing, case studies, audio-visual presentations, group discussions, lecture discussions, after action reports, drills and exercises, Web site access, and computer simulations as delivery methods. In addition, do not forget to give adequate breaks; most adults are not used to sitting all day. Breaks help to keep the delivery fresh and also provide peer to peer learning opportunities.
- The learning environment must encourage active participation. Encourage participation and interaction by arranging chairs, tables, screens, whiteboards, and other learning stations in the classroom. Make the arrangement easily changeable to allow different kinds of interaction and avoid distractions. Make the physical environment (e.g. temperature, lighting, ventilation) of the classroom comfortable to allow learning.
- Adult learners need direct experience to apply new skills. This principle is the foundation of the need for the realistic hands-on component of skills training – the physical training. Scores on a knowledge test are not a satisfactory indication that new skills can be effectively and safely applied in the work environment. Opportunities must be provided for skills to be evaluated and found sufficient to safely apply the knowledge.
- New skills should be based upon current skills. The new skills required by a firefighter, plant worker, or driver to safely perform their work



Picture courtesy of University of Nevada, Reno (UNR), Jean Dixon photographer

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photographer



during a HAZMAT incident or hazardous waste cleanup operation must be suited to the individual's current occupational skills. For example, drivers should already be qualified to operate their equipment before they receive training to operate the equipment under the unique circumstances of the hazardous waste cleanup site.

- Adult learners need frequent non-judgmental feedback. Adult learners need to know how they are doing in a manner that is not judgmental and preferably from their peers. Training

experiences of other participants. A terrific example of this happening informally is seen during breaks at the Fire Science Academy. See if you observe this in your organization.

- Adult learning must be reinforced. The knowledge and skills learned for work in the HAZMAT environment must be retained to be of value to the student and their organization. This is the primary purpose of refresher training, which must include critical skills aspects. Site-specific training and periodic drills also serve as reinforcement mechanisms as newly learned knowledge and skills are applied in an actual or simulated work environment.
- Learning methods must consider the learner's technological fluency. Not all adult learners are comfortable or fluent with technology-enhanced training tools, such as computer-based or Web-based methods. The students' comfort level and fluency with technology must be considered during curriculum design and before choosing technology-enhanced instructional methods.

Training Plans

Now that we understand the characteristics of good training programs, and how adults learn, the next step is to apply this knowledge in the development of the training plan. This subject could encompass an entire article in itself, but here are a few considerations to get you started.

According to the Info Please dictionary (See <http://www.infoplease.com>) the definition of the word "plan" is:

Pronunciation: (plan)

—*n.*

1 a scheme or method of acting, doing, proceeding, making, etc., developed in advance: *battle plans.*

2 a design or scheme of arrangement: *an elaborate plan for seating guests.*

3 a specific project or definite purpose: *plans for the future.*

Once the overall view is established it is time to break it down into tangible steps or "Enabling Objectives." These are the steps taken along the way to reach the program's desired results. These objectives define what knowledge and skills are required to successfully complete the program.

must respect students existing knowledge, skills, experiences, and circumstances. Opportunities must be provided for constructive feedback to each student in the training course.

- Small group activities are important to adult learners. This approach provides an opportunity for individual learners to share and discuss what they have learned with their peer students. As adult learners benefit from the

—*v.t.*

1 to arrange a method or scheme beforehand for (any work, enterprise, or proceeding): *to plan a new recreation center*

2 to make plans for: *to plan one's vacation.*

3 to draw or make a diagram or layout of, as a building.

Note within the definition there is no mention of not being able to *change* your plan. Training should be dynamic, recognizing that information

and techniques change. Thus the training plan is just a map to lead you towards your training goals. Of course, this begs the obvious questions – What is the goal of your training program? What should the students know and be able to do at the end of the program? We refer to this as the “Terminal Objectives.” In the case of hazardous materials training, the goal(s) may be to be compliant with applicable legislation and company policy.

Once the overall view is established it is time to break it down into tangible steps or “Enabling Objectives.” These are the steps taken along the way to reach the program’s desired results. These objectives define what knowledge and skills are required to successfully complete the program.

How do you make sure the students can reach the program goals? By incorporating the characteristics of successful programs and applying the principles of adult learning into a lesson plan. Lesson plans guide the delivery of the classes. They make sure what needs to be done is done. It would be unfortunate to reach the end of the allotted time for the program without accomplishing the terminal objectives, and, in our example, students would not be in compliance with legislative and company standards.

Now that our class has completed their lessons, the question becomes, how do we know the students gained the knowledge and skills they need, and how did we as trainers accomplished our goals? Administering written and practical tests to students provides them, the instructors, and the program developers with a tool to measure their success. The accuracy of this measurement can be increased by using pre-tests to establish the base line.

The plan is not complete unless it contains an evaluation loop, a method to assess the compliance with the plan and its overall success. This evaluation should be done by the program developer and include feedback from the students and instructors. When possible it is wonderful to have input from other responders, the student’s team, and management or other supervising authorities. The evaluation should assess if the characteristic and principles used to develop and deliver the class were appropriate. Comparisons should be made and focus on what degree did the program accomplish the objectives, what went well, what did not go well, was the class instructed as designed, what changes should be considered, and how can this program be improved. While evaluation is critical in the process, it deserves mention that a well thought out process for making program changes should be used.

Summary

As you can see there are many nuts and bolts to putting together a winning program. If you incorporate these ideas into your programs, you will increase their effectiveness while saving valuable time and money over the long run.

Key points from this article for you to employ:

Excellent programs are accurate, comprehensive, clear, practical, rational, and emotional.

Adults learn:

- by doing; realistic hands-on exercises are essential
- from a variety of learning activities
- best from their peers
- in small groups

Training Plans should:

- be dynamic, changing as required
- identify terminal and enabling objectives
- include written evaluation techniques
- employ sound evaluation and monitoring loops

Sources

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*Much of this material was adapted from Nina Wallerstein and Harriet Rubenstein, **Teaching About Job Hazards** (American Public Health Association, 1__3)

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Challenges to the designer:

Exiting from high-rise & large mixed-use buildings

High-rise and large mixed-use buildings are located throughout the world. These facilities have the potential to contain a tremendous amount of occupants, especially gaming resorts. Finding a way to egress building occupants in an emergency can be a challenge depending on the complexity of the facility and the uses within the complex. When multiple uses come together in one of these facilities, the exiting challenges can grow exponentially. These facilities are sometimes referred to as “Mega Resorts”.

By Virginia Charter and Jeff Grove

RJA Group, Inc.

Typically designed around a casino and hotel premise, Mega Resorts have developed to include all the amenities a consumer could imagine within one facility. Obviously, this is intended to keep occupants at the same place to maximize revenue (e.g., gaming, entertainment, retail, restaurants, etc.).

Las Vegas, Nevada and Macau, China are two such destinations that have taken the concept of the Mega Resort to new levels. Although Las Vegas has been a part of the resort industry for over fifty years, ideas for larger and more encompassing resorts to replace those previously in operation has been the norm over the past twenty years. These facilities are attracting tourists by the millions each year. Macau is relatively new to the

resort industry, but has not suffered for lost time and is predicted to be just as glamorous and stimulating as Las Vegas.

Dubai, located in the United Arab Emirates, has also recently entered the construction of extremely tall and large facilities. Although not associated with gaming, the facilities in Dubai do not lack in size or substance. However, these facilities also present significant challenges to the designer to determine how to address a satisfactory means of egress.

The layout of the Mega Resort typically includes a parking structure, podium levels, and residential high rise towers. The podium levels are typically arranged to house the amenities for the public. Whether it be theaters to attend Broadway style

Pic courtesy of RJA Group



productions, a retail complex that would rival any local mall, an expansive pool, multiple restaurants and nightclubs, or a wedding chapel; these uses, that by themselves could pose unique egress concerns, have been incorporated within these mega facilities to push the limits of the egress system. The number of podium levels varies from resort to resort and is generally between one to five levels. The hotel tower provides thousands of rooms and suites for overnight guests.

Challenges

Typically, the larger the resort, the greater the challenges presented for life safety related systems within the facility. Each facility competes with its predecessors to have a more elaborate theater, a larger convention center, a more expansive casino floor, taller residential tower accommodations, unique shopping opportunities, varied dining experiences, and amenities to better a patron's overall experience and entice future visitors. Tower heights, large occupant loads, multiple uses, proximity to property lines, paths for exit discharge, common path of travel, and travel distances are common challenges for these resorts.

These resorts contain just about everything a city does. Almost all the major occupancies called out in the International Building Code (IBC) are in these facilities. In addition to the amenities provided to patrons (gaming, shopping, dining, etc.), there are just as many back-of-house support areas. Many times these areas are even located on intermediate levels that patrons do not even know exist. These support areas often include offices, mechanical and electrical rooms, storage, kitchens, and loading docks. On occasion, these back-of-house areas can also include hazardous occupancies, such as fuel for emergency generators and fire pumps, bulk pool chemical storage, etc. Because of the multiple occupancies located within the resorts, additional challenges come with these mini-cities. Occupancy separations, high security areas, the desire to keep the public out of unoccupied spaces, or employee only areas also

add complexity to the egress design. Additionally, these massive properties are all contained within sites that can range from 20 to 70 acres. Compare this to a city whose high density could be spread over 10-square miles. Each resort is jammed packed into these sites and the building or buildings can also approach adjacent property lines. Space within these facilities is at a premium and exiting is not always the initial focus of the designers.

Sometimes coinciding with these mega resorts and other times standing alone, it is common practice to have residential or office high rise towers in excess of 500 feet. Sometimes these facilities reach more than 1,000 feet above grade. These heights lead to new challenges in exiting.

Within every large facility there are multiple high-rise stairs serving the hotel tower, levels of the podium, and the parking garage. Many of these stairs face the challenge of exit discharge due to their location within the facility. Many of these stairs are not located on the exterior portion of the facility. As such, these stair terminations reside in the middle of the resort. Once occupants achieve a level of protection (i.e. a two hour exit enclosure), that level of protection or greater must be provided to the exterior of the building. Through the use of intermediate levels, horizontal stair transfers may be added to avoid having a two hour enclosure running through the main podium levels.

With facilities of this magnitude, exits need to be distributed evenly. The IBC limits the maximum distance an occupant is allowed to travel before reaching an exit, as well as the maximum common path of travel. Typically the main podium levels of large resorts stretch well over 1,000 feet in one dimension. Now, not only is capacity an issue with exits, additional exits need to be provided and placed to address maximum travel distances. Maximum travel distances are quantified within the IBC based upon the occupancy group, and whether automatic sprinkler protection is provided. For most occupancies within these fully sprinkler

facilities, the maximum travel distance from any point to the closest exit is 250-feet.

Another component of the means of egress system is the limitation of the maximum common path of travel. Common path of travel is defined in the IBC to be "that portion of exit access which the occupants are required to traverse before two separate and distinct paths of egress travel to two exits are available." Common path of travel challenges within these facilities typically occur in back-of-house areas and large residential units. Rooms or spaces that may require only a single exit due to a limited occupant load would require a second exit if the common path of travel was exceeded.

The maximum occupancy for these facilities rivals the total population of many cities. For example, the average new gaming facilities must accommodate anywhere between 70,000 to 100,000 occupants worth of egress capacity, with some of the larger facilities approaching over 250,000. This is due to not only these facilities being very large, but also the IBC requirement that all portions of the building be considered to be occupied simultaneously. Large occupant loads are a major concern for the egress systems within these Mega Resorts, since available floor space needs to include exits. Space within these resorts is at a premium and the location of these exits is a critical balance. Additionally, the largest of these occupant loads are not always located at grade level. As a result, there could be 20,000 to 40,000 occupants on each of the podium levels. These loads could account for up to 750 feet of exit width. This is a considerable amount of space when trying to maximize revenue generating space within a building. It has also become common practice to put large assembly uses at the top of residential towers, such as night clubs, restaurants, pool decks, etc. This issue results in larger exit stairs that potentially take away from guest rooms, condominium units, or even leased areas on lower tower and podium levels.

Solutions

There are several solutions that can be used to alleviate the impact on exit width for these facilities. These solutions may all need to be used depending on the level or sometimes only one will resolve the exiting issues. Two examples of prescriptive code compliance that may address exiting challenges include scissor stairs and horizontal exits. A third solution to improve the impact on exit capacity, when allowed by the local authority, is separate evacuation zones. There are two additional solutions for high rise buildings to aid in the evacuation occupants. These solutions include the use of area of refuge floors or the use of elevators in full building evacuations. Some facilities may require both.

Scissor stairs are a great way to add to the capacity of an exit without significantly increasing the width. Each scissor stair will have two separate entrances with two separate sets of treads that criss-cross each other. However, it is important to remember, that scissor stairs can only add to the capacity of an exit. Even though there are two separate entrances into this stair, it can only be considered as one exit since they are essentially within one stair shaft. It should be noted that some international codes recognize double helix



Jin Mao building in Shanghai, PR China. Picture courtesy of Rolf Jensen & Associates

stairs as separate exits. These are similar to scissor stairs in that the two sets of treads criss-cross each other. The difference is that each set of stair treads, landings and stair entrances are separated from each other by two-hour construction. Although explicitly not permitted by the IBC, this means of stair construction has been utilized successfully in several areas of the world to address required additional exits.

Horizontal exits are another solution that can be utilized to approximately double the number of exits and the amount of exit capacity without a need for additional stairs. Since up to 50 percent of the number of exits and capacity can be configured with horizontal exits, this can help reduce stair widths within the building. Horizontal exit walls are required to be continuous from the exterior wall to the exterior wall of a building creating a two hour fire resistive constructed separation between the two areas. Once occupants have crossed the two hour barrier, they are considered to have exited the area being evacuated. However, on the opposite side of the horizontal exit wall, a refuge area providing sufficient room for the exiting occupants, as well as the occupants already anticipated in that area. From the refuge area, occupants are required to be provided with a clear path either directly to the exterior or to a rated stair enclosure to take them to the exterior of the building. Horizontal exits are an effective means of egress for convention centers, ballrooms and theaters, as well as dividing casinos from other areas of the resort. These inherent architectural boundaries for these uses can then be effectively are utilized for horizontal exit purposes. For podium levels located at grade, the use of horizontal exits and multiple exterior exits is usually sufficient to meet the exiting needs.

When allowed by the local authority, a third solution that is typically used on high density podium levels is separate evacuation zones. Evacuation zones coincide with the fire alarm, sprinkler, and smoke control system boundaries and naturally utilize the horizontal exit walls as

Pic courtesy of RJA Group



some of the boundaries. When using separate evacuation zones, the entire floor no longer exits at the same time. Occupants within one zone would exit, while the other zones would remain in normal mode. This way both exit stairs and horizontal exits can be used by multiple zones and in a sense utilizing the same exit capacity many times. Evacuation zones are a viable option because with these mega resorts the type of construction (Type IA or IB) is the most restrictive and in a sense each zone is enclosed by two hour rated construction. Using separate evacuation zones is an extension of the provisions allowed for a horizontal exiting scheme, since not all areas of the floor will be evacuated.

Due to the significant height of high rise towers, additional protective methods may be considered and utilized for the overall exiting system. Although not a requirement within the IBC area of refuge floors are a means to allow occupants to gather and rest during an event within exceedingly tall high rise structures. Typically located every ten to thirty levels depending on the project and jurisdiction, refuge floors are either open to the atmosphere or completely enclosed. Refuge floors are of the same construction of the stair shaft that it serves and sized to allow for three square feet per person of the floor of alarm, floor above, and floor below since those would be the floors evacuated. Occupants can enter these levels only from the exit stair. These levels are used to have occupants gather for further instruction by trained personnel (either building management or fire rescue). These levels can also be used as a resting place for occupants because should they want to continue, occupants would re-enter the stair and continue down to the next refuge floor or to the building exterior.

Though it is not a new practice and not recognized by the IBC, the use of elevators for ambulatory evacuation is still being defined through different projects in the world depending upon the height and complexity of the facility. The most effective use of elevators for this type of evacuation is typically when the building as a whole needs to be evacuated. Should this be the case, through the use of the voice evacuation system, occupants would be instructed to meet on designated floors (by means of an exit stair) where elevators would pick occupants up and take them to the ground level. The elevators are on both normal and emergency power and are only used once the building and building systems affecting the elevators are deemed safe.

As an alternative to the prescriptive requirements of the building code, performance based solutions may also be utilized for numerous aspects of the required means of egress, including extended travel distances, and increased exit capacities. These solutions may include tenability analyses to determine the maximum amount of time occupants are provided with a tenable environment to exit the area under consideration. Timed egress analyses can then be computed to determine the maximum travel distances that occupants are permitted given this tenability analysis. Further, computer based models can also be utilized to determine if exit components can accommodate greater numbers of occupants, also based upon this tenability analysis. Of course, these solutions are also dependent upon the authority having jurisdiction being comfortable with the conclusions of these analyses.

Summary and conclusion

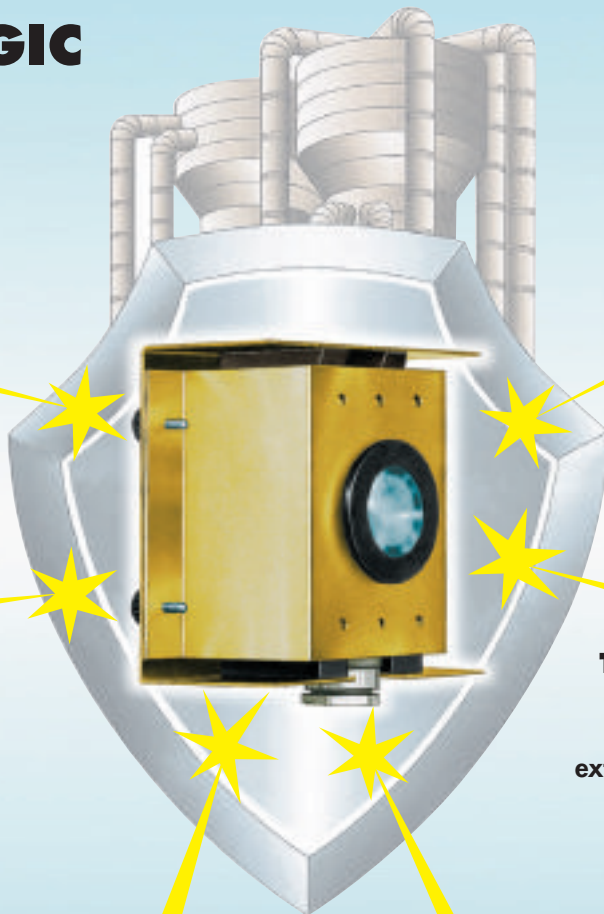
These Mega Resorts or high rise buildings can be overwhelming from a life safety aspect, especially the required means of egress systems. Breaking the facility down by levels and areas helps alleviate the prospect of having to exit an entire facility simultaneously, which can rival the size of small cities. It can be broken down into the same categories as above; high rise levels, garage, and podium. From there, each level may need to be further broken down and evaluated. Parking garages are usually the lesser challenging aspect of the facility followed by typical residential levels. However, the more challenging residential levels with larger guest suites or the upper levels containing high density occupancies (night clubs, pool decks, restaurants) as well as the podium levels will need to apply several of the solutions listed above.

Mega Resorts and high rises are the norm as desired destinations throughout the United States and the world. Exiting from these facilities is extremely challenging when dealing with so many factors, while trying to keep the design intent of the owner and architects in mind. Since floor space is at a premium, cost on the high density floors, creative solutions to exiting are almost always required. Through the use of multiple stairs/exits, scissor stairs, horizontal exits, separate evacuation zones, interior stair transfers, area of refuge floors, and elevator evacuation, these buildings can be designed efficiently to provide both entertainment and safe evacuation for those patrons. The ultimate design is to make the required exits augment the architectural design.

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Hiranandani Gardens
Powai
Mumbai -400 076
India
Tel: +91 22 25700392
Fax: +91 22 25701110
Dealer/Distributor

KOREA (SOUTH)**HI MAX CO LTD**

Sicox Tower 115-Ho 513-14
Sangdaewon-Dong
Jungwon-Gu
Sungnam-City
Kyungki Do
Korea
Tel: +82 31 769 7698
Email: khkim@himax119.co.kr
Dealer/Distributor

MALAYSIA**FITTERS ENG SERVS SDN BHD**

No.1 Block C
Jalan Dataran Sd1 Pju 9
52200 Bandar Sri
Damansara
Kuala Lumpur
Malaysia
Tel: +60 3 62767155
Fax: +60 3 62758712
Dealer/Distributor

NEW ZEALAND**AMPAC INDUSTRIES LIMITED**

PO Box 100-149
North Shore Mail Centre
Glenfield
Auckland
Tel: +64 94438072
Fax: +64 94438073
Dealer/Distributor

SINGAPORE**ACCLAIM SYSTEMS PTE LTD**

Blk 104 Boon Keng Road
05-01 Singapore 339775
Tel: +656 2990 798
Fax: +656 299 3735
Dealer/Distributor

ALARM SUPPLY PTE LTD

63 Jalan Pemimpin
03-07 Pemimpin Industrial Building
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
Dealer/Distributor

SRI LANKA**FIRETECH (PVT) LTD**

34, Walter Gunasekara
Mawatha
Nawala
Sri Lanka
Tel: +94 1 806613
Fax: +94 1 806666
Dealer/Distributor

TAIWAN**HORING LIH IND CO LTD**

4f No 18 Lane 327
Chung Shan Road
Sec 2 Chung-Ho-City
Taipei Hsien
Taiwan
Tel: +886 2224 87599
Fax: +886 2224 07752
Dealer/Distributor

THAILAND**F.B. (THAILAND) LTD**

75 Soi Rubia
Sukhumvit 42 Road
Bangkok 10110
Thailand
Tel: +66 2 3902445
Fax: +66 2 3811197
Dealer/Distributor

TEEYA MASTER SYSTS CO LTD

100/101-102 Vongvanji
Building B, 30th Flr
Rama 9 Road
Huaykhwang
Bangkok 10320
Thailand
Tel: +662 2 6451130
Fax: +662 2 2488540
Dealer/Distributor

HALE PRODUCTS EUROPE**AUSTRALIA****GAAM EMERGENCY PRODUCTS**

Contact: Ian Price
Tel: 03 9466 1244
Fax: 03 9466 4743
Email: iprice@tycoint.com
Website: www.gaam.com.au
Dealer/Distributor

BANGLADESH**FAWN INTERNATIONAL**

Contact: Mahamud Hassan
Tel: 880 2 9333097
Fax: 880 2 8319470
Email: fawnintl@citechco.net
Dealer/Distributor

INDIA**CONTAVIDE ENTERPRISES PVT**

Contact: Sharat Mathur
Tel: 011 648 5314
Fax: 011 262 2735
Email: mpsindia@del3.vsnl.net.in
Dealer/Distributor

INDONESIA**PT MASTE DAYA**

Contact: Bondan Supartha
Tel: +62 21 751118
Fax: +62 21 7511121
Email: salesmd@cbn.net.id
Dealer/Distributor

JAPAN**TEIKOKU SEN-I CO LTD (TEISEN)**

Contact: Yoshiki Odawara
Tel: 81 3 3281 3028
Fax: 81 3 3274 6397
Email: odawara@teisen.co.jp
Website: www.teisen.co.jp
Dealer/Distributor

MALAYSIA**PANDAN NIAGA SDN BHD**

Contact: Mr Rashdi
Tel: 03 5122 1310
Fax: 03 5122 1279
Email: pnsb@pn.com.my
Dealer/Distributor

SINGAPORE**SK FIRE PTE LTD**

Contact: George Gauron
Tel: +65 686 23155
Fax: +65 686 20273
Email: Gauron@skfire.com
Dealer/Distributor

SRI LANKA**DYNATEC (PVT) LTD**

Contact: Nihal Abeygunawardene
Tel: +94 11 2454351
Fax: +94 11 2454350
Email: sales@dynatec.lk
Dealer/Distributor

TAIWAN**CHANG'S WORLD ENTERPRISES PVT LTD**

Contact: Marisa Chang
Tel: +886 2 2715 3658
Fax: +886 2 2712 3659
Email: gchworld@ethome.net.tw
Dealer/Distributor

HOLMATRO RESCUE EQUIPMENT**AUSTRALIA****CHUBB FIRE SAFETY LTD**

120, Silverwater Road
Silverwater, NSW 2128
Mailing Address: Locked Bag 102
Silverwater 1811
Contact: Andrew Loftus
Tel: 1300 369 309
Fax: 02 8748 7450
Email: firesafety@chubb.com.au
Website: www.chubb.com.au
Dealer/Distributor

HONG KONG**ABLESLINK CO LTD**

Unit B4, 2/F., Block B
Sheung Shui Plaza
3 Ka Fu Close
Sheung Shui, N.T., Hong Kong
Contact: Randy Hau
Tel: +852-2466 4568
Fax: +852-2466 4569
Email: ableslink@yahoo.com
Dealer/Distributor

INDONESIA**PT ESA KARYA MANDIRI**

Jl.Sunter Paradise
Timur Raya
F21 No.C42 Jakarta 14350
Contact: Benny N Liem
Tel: 062-21-6412936/65303502
Fax: 062-21-6412937
Email: esakarya@cbn.net.id
Dealer/Distributor

JAPAN**AKAO & CO LTD**

4-13-1 Shinmachi Nishi-ku
Osaka, Japan 550-0013
Contact: Masaya Saga
Tel: +81-6-6532-6256
Fax: +81-6-6532-3095
Email: info@akao-co.co.jp
Website: www.akao-co.co.jp
Dealer/Distributor

KOREA (SOUTH)**KEO WHA HITEC CO LTD**

Rm-1F1, Jiwoo Bldg
376-12, Seogyo-dong
Mapo-gu, Seoul, Korea
Contact: Kenneth Zyung
Tel: 82-(02)-336-0145-7
Fax: 82-(02)-336-0180
Email: jfckenneth@yahoo.co.kr
Website: www.kh-hitec.com
Dealer/Distributor

MALAYSIA**PANDAN NIAGA SDN BHD**

No. 81A, Jalan Tabla 33/21
Shah Alam Technology Park
Section 33, 40400 Shah Alam,
Selangor Darul Ehsan, Malaysia
Contact: Mohd Rashdi Abd Rahman
Tel: +603-5122 1310
Fax: +603-5122 1279
Email: pnsb@pn.com.my
Dealer/Distributor

NEW ZEALAND**CHUBB FIRE & SAFETY**

3 Fisher Crescent
Mt Wellington, Auckland
Contact: Steve Kirk
Tel: +64 9 270 7441
Fax: +64 9 270 7235
Email: fireandsafety@chubb.co.nz
Website: www.chubb.co.nz
Dealer/Distributor

PHILIPPINES**WALLGREEN INDUSTRIAL VENTURES CORP**

62 West Avenue
Quezon City, Philippines 1104
Contact: Francisco C Dizon
Tel: +6 32 411 0818
Mobile: +6 32 0917 820 1947
Fax: +6 32 411 0818
Email: wivcor@yahoo.com
Dealer/Distributor

TAIWAN**PARKSON TRADING CO LTD**

10F, No. 32, Wen-Jung Road
Guo-Shan District, Kaohsiung City
80464 Taiwan, R.O.C.
Contact: Johnson Peng
Tel: +886-7-552-1650
Fax: +886-7-552-7999
Email: ptckpeng@parkson.com.tw
Dealer/Distributor

L&W COMPRESSORS**AUSTRALIA****MSA (AUST.) PTE LTD**

137 Gilba Road
Girraween NSW 2145
Contact: Mr Jim Henry
Tel: +61 2 96880333
Fax: +61 2 98963224
Email: aus.customerservice@MSAnet.com
Website: www.msa.net.au
Dealer/Distributor

BANGLADESH**ENGINEERING & ARCHITECTURAL CONSULTANTS LTD**

10 Dilkusha c/a,
Jibon Bima Tower (8th floor), Dhaka – 1000
Contact: Mr Mahfuzul Hannann
Tel: +880 2 9561610
Fax: +880 2 9561606
Email: eac@bdmail.net
Dealer/Distributor

CHINA**L&W COMPRESSORS + SYSTEMS PTE LTD IN CHINA**

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Room 902, #6 Huirun Yuan
Tong Hui Jia Yuan, Front Line
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Fax: +86 10 59679218
Cell: +86 1314 1281608
Email: nathan@lw.com.sg
Website: www.lw-china.com.sg
Representative Office

HONGKONG**OCEAN PROFIT LTD**

G/F, 104A, Fook Wah St
Sham Shui Po, Kowloon, Hong Kong
Contact: Mr Charles
Tel: +852 27081327
Fax: +852 27259270
Email: charles@kikoo.com.hk
Dealer/Distributor

INDIA**CORE ENERGY SYSTEMS PVT LTD**

Plot X/16 – 1 & 2
Prathmesh Vyapari Sankul
MIDC Residential Zone
Dombivli (E) 421 203
Contact: Mr Nagesh N Basarkar
Tel: +91 251 2444800
Fax: +91 251 2444804
Email: nagesh@core.co.in
Dealer/Distributor

INDONESIA**LAUTAN MAS**

Jl. Toko Tiga No.24
11230 Jakarta-Barat
Contact: Mr Idris Pranolo
Tel: +62 21 6901333
Fax: +62 21 6902479
Email: Office@LautanMas.Com
Dealer/Distributor

KOREA**MSL COMPRESSORS LTD**

553, Solun-Dong
Phochon-Si, Kyonggi-Do 487-030
Contact: Mr Si Min, Sung
Tel: +82 541 7000
Fax: +82 542 2999
Email: htindus@empal.com
Dealer/Distributor

HYSINE TRADING

The #Centum Park
102-2704 Haeundae-gu
Jaesong 1 dong Busan
PO Box 612-712, Busan
Contact: Mr Denis Kwak
Tel: +82 51 3143017
Fax: +82 51 9883017
Email: hodigi2@yahoo.co.kr

Dealer/Distributor**MALAYSIA****SINERGI IKRAM (M) SDN BHD**

No. 4, Jalan TPP 5/7
Taman Perindustrian Puchong
47100 Puchong, Selangor
Contact: Mr Yusoff
Tel: +60 3 80683929
Fax: +60 3 80682091
Email: synergy@tm.net.my

Dealer/Distributor**PAKISTAN****MODERN MOTORS PVT LTD**

Beaumont Road Modern Motor House
PO Box 8505
Karachi 75530, Pakistan
Contact: Mr Asif Chaudri
Tel: +92 21 5680347
Fax: +92 21 5680903
Email: mmlparts@cyber.net.pk

Dealer/Distributor**PHILIPPINES****ASIA DIVERS PADI 5 STAR CDC CENTRE**

El Galleon Beach Resort
Abimir Place, 1741 Dian Street
Palanan, 1235 Makati City
Tel: +63 2 8342974
Fax: +63 2 2873205
Email: tommy@asiadivers.com
Website: www.asiadivers.com

Dealer/Distributor**SINGAPORE****L&W COMPRESSORS + SYSTEMS PTE LTD**

5 Tank Road,
Nagarathar Building #02-02
Singapore 238061
Contact: Mr Peter Schmitt
Tel: +65 67321178
Fax: +65 67321176
Mob: +65 98160248
Email: Peter@lw.com.sg
Website: www.lw.com.sg

Representative Office**SRI LANKA****LSR LANKA SPORTREIZEN**

Kalubowila, Dehiwela
29 B, S.DE. S. Jayasinghe mawatha
Tel: +94 11 2824500
Fax: +94 11 2826125
Email: lsr@sri.lanka.net
Website: www.lsr-srilanka.com

Dealer/Distributor**TAIWAN****FIREWOLF**

1F, No. 13, Lane 89
Jiang-Nan St., Nei-Hu, Taipei
Contact: Mr Todd Lin
Tel: +886 2 26582626
Fax: +886 2 27977890
Email: todd@firewolf.com.tw
Website: www.firewolf.com.tw

Dealer/Distributor**FULGENT SCIENTIFIC INC**

1/F, 27
66 Lane Jui Kuang Road, Taipei
Contact: Mr Sheen
Tel: +886 2 87925406
Fax: +886 2 87925734
Email: fulgent@ms13.hinet.net

Dealer/Distributor**THAILAND****DIVE MASTER CO LTD**

16 Asoke Court, Sukumvit 21 Road
Wattana, 10110 Bangkok
Contact: Mrs Pornchan Chankajorn
Tel: +66 2 2593191
Fax: +66 2 2593197
Email: info@divemaster.net

Dealer/Distributor**ONE STOP DIVE CENTRE CO LTD**

290/30-32 Moo 2, Tambon Ao Nang
Amphur Muang, 81000 Krabi
Contact: Mr Glyn
Tel: +66 75 637926
Fax: +66 75 637929
Email: glyn@onestopdive.com
Website: www.onestopdive.com

Dealer/Distributor**VIETNAM****LOADCELL SERVICES PTE LTD**

143 Binh Gia
Vung Tau, S R Vietnam
Contact: Mr Chris Evans
Tel: +84 64 582373
Fax: +84 64 581254
Email: lcsvn@loadcellservices.com

Representative Office**PBI PERFORMANCE PRODUCTS****AUSTRALIA****ELLIOTT AUSTRALIA PTY LTD**

PO Box 509
23 Vauxhaul Street
Virginia, QLD 4014
Tel: (617) 3265 2944
Fax: (617) 3265 2903
Website: www.elliottaustralia.com

LION APPAREL ASIA PACIFIC

Unit 13, 15 Dunstan Road, Wingfield
South Australia 5013, Australia
Tel: +61 8 8139 7777
Fax: +61 3 8139 7788
Email: LionAsia@lionapparel.com
Website: www.lionapparel.com

Representative Office**MELBA INDUSTRIES**

PO Box 466, Thomastown
VIC 3074, Australia
Tel: +61 3 9474 3072
Fax: +61 3 9464 4114
Email: robert.walsh@melbaind.com.au
Website: www.melbaind.com.au

Dealer/Distributor**STEWART & HEATON CLOTHING CO PTY LTD**

150 Francisco Street
Belmont
WA 6104, Australia
Tel: +61 8 9277 5555
Fax: +61 8 9277 5455
Email: admin@shcc.com.au
Website: www.shcc.com.au

Dealer/Distributor**CHINA****WAH TAI ENTERPRISES**

PO Box No. 10303, General Post Office
Hong Kong, China
Tel: 852-9098-7262
Fax: 852-2782-0718
Email: johnnyho@wttyf.com
Website: www.wttyf.com

Dealer/Distributor**RESQTEC****AUSTRALIA****DELTA FIRE AUSTRALASIA PTY LTD**

PO Box 2149
Mansfield
Queensland 4122
Australia
Contact: Mr Bob Grieve
Tel: +617 3277 6063
Fax: +617 3277 6036
Email: bob@deltafire.com.au

Dealer/Distributor**BANGLADESH****MANIK BROTHERS**

Hai Mansion (3rd Floor)
9/3 Motijheel Circular Road
Dhaka – 1000, Bangladesh
Contact: Mr A K Bhowmick
Tel: +880-2-710-0589/+880-2-710-0827
Fax: +880-2-710-1331

Dealer/Distributor**CHINA****TUNG SHING TRADE DEVELOPMENT CO LTD**

Room 1601, Yishang Building
No. 11, Malian Road
Guang Wai 100055 Beijing
Contact: Mr Joseph Yip/Mr Roy Tsoi
Tel: +86 10 6339 5834
Fax: +86 10 6328 8649
Email: info@tungshingfire.com

Dealer/Distributor**HONG KONG****TUNG SHING TRADE DEVE'L CO LTD**

Suit 906, 9/F, ICBC Tower
3 Garden Road, Central Hong Kong
Contact: Mr Joseph Yip/Mr Roy Tsoi
Tel: (852) 2578 6088
Fax: (852) 2887 6993
Email: roytsai@tungshingfire.com

Dealer/Distributor**INDIA****AIR DRIVE EQUIPMENTS CO PVT LTD**

Aman Chambers
113, New Queens' Road
P.O. Box 3695
400 004 Mumbai, India
Contact: Mr Vinod Bhojania
Tel: +91 2223678689
Fax: +91 2223675229/+9 2223639163
Email: airdrive@vsnl.net

Dealer/Distributor**INDONESIA****PT LAVINTA BUANA SAKTI**

Komplek Rukan Puri Kencana
Block K7 No. 3e
Jakarta 11610, Indonesia
Contact: Ms G Any Nurcahyanti, Se
Tel: +6-2215823570
Fax: +6-2215826676
Email: lavinta@cbn.net.id

Dealer/Distributor

JAPAN**Z-PRODUCE COMPANY**

6-3-17, Tanimachi Chuo – Ku
542-0012 Osaka City, Japan
Contact: Mr Satoru Hayashi
Tel: +816-6-768-9700
Fax: +816-6-762-4837/+886-3-322-3908
Email: info@zumro-pro.com
Dealer/Distributor

KOREA (SOUTH)**DAE RYUK TECH CO**

(4 X 4 KOREA)
#BA-1212 Chung-Ang
Circulation Complex
1258 Kuro-Dong, Kuro-Gu
Seoul 152-721, Korea
Contact: Mr Sung Dong, Kim
Tel: +82-2-2625 5060
Fax: +82-2-2625 5535
Email: top@119rescue.com
Dealer/Distributor

PAKISTAN**HASEEN HABIB CORPORATION (PVT) LTD**

27, Nicholson Rd
Lahore 54000, Pakistan
Contact: Mr Ata-ur-Rahman Barry
Tel: (042) 636 7222
Fax: (042) 636 8855/(042) 637 4041
Email: barry@firechief.com.pk
Dealer/Distributor

PHILIPPINES**BOSTON HOME INC SUPPLY**

168, Apo St
Sta. Mesa, Heights
Quezon City, Philippines 1100
Contact: Bernard Tiongson
Tel: +632-4123726
Fax: +632-4150130
Email: boston@pldttdsl.net
Dealer/Distributor

TAIWAN**BOSS MOTOR CO LTD**

No.10, Alley 8, Lane 227, 4 Sec.
Chang Hsing Rd, Lu Chu Shiang
Taoyuan (338) Taiwan. R.O.C.
Contact: Mr F T Chen
Tel: +886-3-3118199
Fax: +886-3-322-3908
Email: boss.motor@msa.hinet.net
Dealer/Distributor

THAILAND**ROYAL EN-TECH CO LTD**

88, Phichai Road Dusit
Bangkok 10300
Contact: Mr Somphop Kongdej-Adisak/Mr Phichit Thinsantisuk
Tel: +662-6691191-3/+662-2436215-7
Fax: +662-2411839/+662-2430105
Email: royalent@ksc.th.com
Dealer/Distributor

VIETNAM**HIEPHOA EQUIPMENT OF ENVIRONMENT AND TRADING CO LTD**

11, Nguyen Chi Thanh
Dong Da Dist., Hanoi, Vietnam
Contact: Ms Minh Phuong/Mr Trung
Tel: +84 4 7731961
Fax: +84 4 7731962/+84 4 7734553
Email: minhphuong0603@gmail.com/
hiephoa@hn.vnn.vn
Dealer/Distributor

ROSENBAUER**AUSTRALIA****SASGAR PTY LTD**

137 Rainbow Street
Sandgate Qld. 4017, Australia
Tel: +61 – 7 – 3869 7000
Fax: +61 – 7 – 3869 7001
Email: sasgar@sasgar.com.au
Website: www.sasgar.com.au
Dealer/Distributor

BRUNEI**ESKAY ROSENBAUER SDN BHD**

No.18 Ground Floor
Bangunan Desa Delima
Simpang 44, Km 9
Jalan Muara BB4713
Brunei Darussalam
Tel: +673 2345670
Email: yahya@skfire.com
Website: www.skfire.com
Dealer/Distributor

CHINA**ROSENBAUER INTERNATIONAL AG**

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Towercrest Plaza
No. 3, Mai Zi Dian West Road
Chao Yang District
Beijing, 100016, P.R. China
Tel: +86 10 646 721 28
Fax: +86 10 646 720 28
Email: rosenbauerbj@163.com
Representative Office

ROSENBAUER YONGQIANG FIRE FIGHTING VEHICLES LTD

Tangchun Industrial Estate
Liaobu, Dongguan
Guangdong, China
Tel: +86 769 8326 9778
Fax: +86 769 8326 9758
Email: office_rbiyq@126.com
Website: www.rosenbauer.com
Representative Office

SINGAPORE**SK FIRE PTE LTD**

8 Tuas Drive 2
SGP-Singapore A638643
Tel: +65 8623 155
Fax: +65 8620 273
Email: office@skfire.com
Website: www.skfire.com
Dealer/Distributor

SAGE TECHNOLOGIES**P.R. OF CHINA****NORLAN ENTERPRISES INC**

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Lingdi Office Building 1
#13 Bei Yuan Road
Chaoyang District
Beijing 10017
P.R. of China
Tel: 86-10-5109-5605
Fax: 86-10-5109-5607
Email: stefaniewang@norlan.cn
Dealer/Distributor

JAPAN**COMTEC COMPANY**

Tokyo 202-0023, Japan
Tel: +81 4 22 72 1199
Dealer/Distributor

SECURITON AG**AUSTRALIA****AUSTRALIAN FIRE ENTERPRISES (AFE)**

PO Box 7027, Manner Park
NSW 2259, Australia
Contact: Mike Donegan
Tel: 61 2 43 592 244
Fax: 61 2 43 593 301
Email: aifrs@ozemail.com.au
Dealer/Distributor

CHINA**SIGNALBAU HUBER INTELLIGENT TRAFFIC SYSTEM EQUIPMENT (SHANGHAI) CO LTD**

3065 He Chuan Road
Shanghai 201103, P.R. of China
Contact: Rolf Naegele
Tel: +86 21 6446 4466
Fax: +86 21 6446 4131
Email: sbhsha@public3.sta.net.cn
Website: www.signalbau-huber.com
Dealer/Distributor

HONG KONG**YIU WAH (KOGARAH) CO LTD**

Room 901, 9th Floor, No 113 Argyle Street
Mongkok, Kowloon, Hong Kong
Contact: Raymond Ng
Tel: +852 2781 1384
Fax: +852 2782 6652
Email: ywk@ywk.com.hk
Website: www.ywk.com.hk
Dealer/Distributor

INDIA**VIMAL FIRE CONTROLS PVT LTD**

19/20 Vardhaman Service
Industrial Estate, L.B.S. Marg.
IN-400083 Vikhroli (West) Mumbai, India
Contact: Vijay Doshi
Tel: +91 22 2578 3335
Fax: +91 22 2578 3338
Email: vijay@vimalfire.com
Dealer/Distributor

KOREA (SOUTH)**ROYAL INFORMATION TECHNOLOGY CORPORATION**

Royal Building, 3rd Floor, 840-5 Yeoksam-Dong
Kangnam-Ku, Seoul, Korea
Contact: J S Chung
Tel: +82 2 567 8881
Fax: +82 2 567 8831
Email: jschung@ritco.co.kr
Website: www.ritco.co.kr
Dealer/Distributor

MALAYSIA**SECURITON AG, REPRESENTATIVE OFFICE ASIA**

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MY-60000 Kuala Lumpur, Malaysia
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Fax: +60 3 7725 1677
Email: asia@securiton.com.my
Website: www.securiton.ch
Representative Office

FITTERS HOLDING BHD

Lot 2221, Kg. Jaya Industrial Area
MY-47000 Sg. Buloh Selangor, Malaysia
Contact: Richard Wong
Tel: +60 3 6157 6199
Fax: +60 3 6157 0801
Email: chankokhoe@fittersgroup.com
Website: www.fittersgroup.com
Dealer/Distributor

TAIWAN**ATLAS TECHNOLOGY CORPORATION**

22F, No 1 Bausheng Road
Yunghe City, Taipei, Taiwan 234, R.O.C.
Contact: David Liu
Tel: +886 2 223 20 556
Fax: +886 2 223 16 657
Email: david@atlasgroup.com.tw
Website: www.atlasgroup.com.tw
Dealer/Distributor

GICTEC INTERNATIONAL COMPUTING CO LTD

No. 49 Goang Shi Road
Kaohsiung, Taiwan R.O.C.
Contact: Franco Lee
Tel: +886 7 715 4285
Fax: +886 7 715 4401
Email: lic@ms9.hinet.net
Website: www.gictec.com.tw
Dealer/Distributor

SAFETY TECHNOLOGY CO LTD

9F-1, 306, Sec. 1
Neihu Road, Taipei, Taiwan R.O.C.
Contact: Terry Chung
Tel: +886 2 8751 6055
Fax: +886 2 8751 6053
Email: tchung@updc.com.tw
Website: www.updc.com.tw
Dealer/Distributor

SOLBERG SCANDINAVIAN AS**AUSTRALIA****SOLBERG ASIA PACIFIC PTY LTD**

PO Box 182
Kingswood NSW 2747, Australia
Contact: Ted Schaefer, Technical Manager
Tel: 61-2-9673-5300
Email: ted@solbergfoams.com
Website: www.solbergfoams.com
Representative Office

MALAYSIA**RHINOSHIELD INDUSTRIES(M) SDN BHD**

H-0-5 Ground Floor Plaza Damas
No. 60 Jalan Sri Hartamas 1
Sri Hartamas, 50480 Kuala Lumpur, Malaysia
Contact: C K Lim, General manager
Tel: +603-62033850
Fax: +603-62032245
Email: rhinoshield@pd.jaring.my
Dealer/Distributor

TASK FORCE TIPS INC**AUSTRALIA****GAAM EMERGENCY PRODUCTS**

29 Temple Dr., PO Box 211 Thomastown
Victoria, 3074, Australia
Tel: +61 3 9466 1244
Fax: 61 3 9466 4743
Email: iprice@tycoint.com
Website: www.gaam.com.au
Dealer/Distributor

CHINA**SHANGHAI JINDE INDUSTRY DEVELOPMENT CO LTD**

Room 610, 1 Lane 50
Xin Cun Road, Shanghai, 200065, China
Tel: +86 21-360-50599
Fax: +86 21-360-55599
Email: jmgushon@online.sh.cn
Dealer/Distributor

HONG KONG**ROTTER INTERNATIONAL LIMITED**

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6-8 Hung To Road
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Tel: 85227517770
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ASIA PACIFIC FIRE MAGAZINE

REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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**June 2008
Issue 26**



Front Cover Picture: Firemen are seen at the site of a fire at the Shanghai World Financial Centre which is under construction in Shanghai August 14, 2007. REUTERS/China Daily (CHINA) CHINA OUT

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Foreword

The Language of Public Education

It is necessary, from time to time to pause and ask ourselves as a Community – where are we going? For the last decade we have been in the midst of an era of great expansion in building and construction: mega shopping centers, state of the art high rises, hospitals, stadiums. Interestingly, this phenomenon is not only particular to major metropolis but second and third tier cities. New communities are being built; and old ones modernized. Cities, towns and villages are changing the landscapes of many countries. In this issue of *Foreword* I would like to make emphasis on the role of public awareness in this era of rapid growth and change.

By Olga Caledonia

Executive Director
International
Operations, NFPA

Recent natural or man made disasters have shown that people in general do seem to be aware that there is a “fire and life safety problem” but for various reasons we have not seen a long-term concern about fire safety and prevention. Many organizations both private and government are directly and actively involved in fire protection and fire prevention activities, for example your local fire department, insurance companies, research laboratories, safety groups and associations, etc. Like NFPA, these organizations are, and have been for many years, reaching out to communities with fire safety and prevention messages.

A few weeks ago, while browsing through some archived NFPA periodicals from the late 60’s, early 70’s I recalled reading about ways to protect the public and the three “E’s”, Education, Engineering and Enforcement. NFPA’s Public Education programs teach people of all ages how to make responsible choices regarding health and safety. One of the most important commitments is to give people the knowledge and skills they need to safer lives.

Each of us has an obligation to our community. Let’s remember that along with the benefits of today’s modern landscape that make our living more comfortable and efficient, we also have a whole new set of safety challenges that need to be communicated to the community. At NFPA we

have a Public Education department dedicated to work with private and government organizations in the United States and abroad. The first “E” Education is put into action through simple messages and comprehensive programs to reach the public at home, school and work with very basic brochures easy to translate into many languages. Key messages from our Older Adult program, *Remembering When* has been translated into more than 20 languages including Chinese, Hindi, Japanese, Korean, Thai and Vietnamese. To download these in the language of your choice visit www.nfpa.org/rwtranslations.

NFPA welcomes feedback from our partners and volunteers worldwide on our different public programs and outreach campaigns. Together we can encourage the general public to practice fire safety and stimulate awareness of the fire problem.

Finally, NFPA would like to extend our sincere and heartfelt condolences for the loss of lives caused by the recent earthquake in the People’s Republic of China and the cyclone in Myanmar. It is a large burden on any country when such natural disasters strike and our thoughts and prayers are with you. In the near future, we can best serve the memory of those lost by continuing our life-saving work and enhancing our codes and standards to reflect the changing needs of those in the fields of life safety, fire prevention and public education.



A NEW CONCEPT OF INNOVATION AND SAFETY

FENZY X-PRO

- 1 Swivelling adjustment of the back plate, designed to follow all the movements of the top half of the back. Height adjustment device of the back plate, in 2 positions.
- 2 Multifunction monitoring device Fenzy Angel II :
 - Digital display : Duration, Pressure, Temperature
 - Several audible and visual alarms
 - Integrable telemetry system
- 3 Movable protective foot of the high pressure system : Gives an additional safety to avoid risks of deterioration of the cylinder valve and reducer.
- 4 Telemetry system : Keep an eye on Firemen remotely, using a data live broadcast. Transmitter relay stations provide signal transmission between Fenzy Angel II devices and the monitoring station. Linked with a PC or a tablet, you are informed in real time of your firefighters' situation.



For more informations, please contact us :
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Unifire Seeks Global Network of Dealers

UNIFIRE AB announces that it has resolved to develop a global network of qualified dealers of its nozzles and monitors.

The Swedish manufacturer of world-renowned hand-line nozzles and stainless steel monitors has since 1969 primarily



worked directly with its customers around the world. Due to Unifire's recent rapid growth in sales – which, the company reports is due in significant part to strong sales of its relatively new and state-of-the-art remote-controlled "Force" monitor series – Unifire is now accepting applications from strong and qualified companies which are interested in dealing in Unifire nozzles and/or monitors in the following industries:

- Municipal Fire Fighting/Vehicle Manufacturers
- Aircraft Rescue Fire Fighting (ARFF)
- Ships, yachts & Marine Industries
- Government, Police & Military (e.g. Riot Control Vehicles, aircraft hangar protection, government contracts)
- Incineration Plants/Renewable Energy Plants
- Tunnel Fire Protection & Automatic Fire Extinguishing Systems
- Building Protection
- Mining Industry
- Industrial Applications
- Oil, Gas & Petrochemical
- Water Trucks & Special Vehicles (Non-Governmental & Non-Mining)



- Non-Traditional Markets (e.g. Zoos, Fountains, Miscellaneous)

Prospective Unifire dealers must demonstrate strong potential and commitment to market and sell Unifire equipment in their respective industries and geographical territories.

Unifire's Director of International Sales & Marketing, Roger Barrett James, has stated that, "Unifire is excited about its decision and commitment to develop a strong network of dealers around the globe. Unifire's new dealership policy provides our prospective dealers with a great opportunity for expansion of sales by offering Unifire's high-quality products, with attractive dealer discounts as well as exclusivity to protect their respective sales and marketing efforts. Unifire anticipates that this new policy will also contribute to enhanced customer service capabilities and will lead to a further increase in global sales."

Interested candidates may download Unifire's Application for Dealership from www.unifire.com and may contact Roger Barrett James for more information at roger@unifire.com or by telephone at +46 303 248 403

Qatari civil defense visit to Bristol seals major order

A high level visit to BRISTOL UNIFORMS from the Qatari Civil Defense has resulted in the award of a large order for firefighter clothing for the Gulf State's civil defence forces. The decision was the culmination of a long period of close collaboration between Bristol's overseas sales team, local distributor Chubb Fire Qatar and the Qatari government.

During February the Director of Resources for the Qatari Civil Defense and a high ranking colleague came to Bristol to tour the design, manufacturing and quality control facilities at Bristol Uniforms to see at first hand how Ergotech™ style fire protective garments are made and to discuss the specific current, and likely future, PPE requirements of the country's civil defence forces.

The outcome was an order for 800 sets of fire coats and trousers. The garments selected are based on Bristol's most recent lightweight design, the Ergotech Action™, incorporating a Titan outer layer with a Gore-tex Airlock™ moisture barrier. This design has been chosen to ensure conformity with the latest European Standard EN469:2005.

Commenting on the company's success, Paul Gibson, Bristol's Regional Export Sales Manager said, "International competition is always strong for major orders of this magnitude and I am delighted with the key role which our distributor, Chubb Fire Qatar, played in helping us secure the business. This is another example of our new lightweight PPE constructions providing the right balance of protection and comfort which has given us a competitive edge much needed in our efforts to continue to expand our presence in overseas markets".

For more information about Bristol Uniforms or Bristol Care™ please contact either:

Roger Startin, Bristol Uniforms Ltd on 0117 956 3101 or email roger.startin@bristoluniforms.com



New training book from Holmatro

'Holmatro's Emergency Shoring & Lifting Techniques'

HOLMATRO RESCUE

EQUIPMENT introduces a compact yet comprehensive guide to equipment handling and techniques for use in emergency shoring and lifting operations: 'Holmatro's Emergency

Shoring & Lifting Techniques'. This 100-page book aims to provide a basis to the principles of emergency shoring and lifting operations, as required for the safe rescue of persons trapped. These principles reach across a range of specific rescue disciplines being passenger vehicle and heavy goods vehicle rescue, collapsed structure rescue and trench rescue. The book covers all of these disciplines including the various types of shoring and lifting equipment commonly used.

'Holmatro's Emergency Shoring and Lifting Techniques' discusses the topics personal safety,

shoring equipment, lifting equipment, hydraulic assist equipment, equipment care & maintenance, load management principles, vehicle rescue, collapsed structure rescue and trench rescue. The book offers a well-balanced mix of theory and practice, and is therefore a valuable training tool. Besides the current English version, the book will be available in other languages soon.

Available through your local Holmatro dealer (see: www.holmatro.com). For more information please contact:
Holmatro Rescue Equipment
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 Website: www.holmatro.com

D-Tec confirmed as Video Smoke Detection (VSD) Market Leader by IMS Research Report

The latest research findings, published by IMS Research, have confirmed D-TEC's position as the global leader in the fast growing area of Video Smoke Detection (VSD), and the number one provider in key regional markets.

In the IMS Research report, entitled: 'World Market for Fire Detection and Suppression Products', D-Tec – part of AD Group – heads-up the Video Smoke Detection category with an impressive market share of 41.3%, based on IMS Research analysis of 2006 data, way ahead of its nearest rival on 24.5%.

D-Tec's VSD technology is particularly effective for the early detection of smoke in lofty, voluminous, environments such as aircraft hangars, manufacturing plants, power stations, warehouses and building atriums.

Said Ian Moore, Managing Director, D-Tec: "We are extremely pleased with the



Sperian Protection Group

Within the SPERIAN PROTECTION GROUP – world leader in PPE market – the Fenzy range is specialized in the field of open and closed circuit respiratory equipment, starting from disposable half-masks to long duration SCBA.

With more than a century of safety expertise and innovation culture, Sperian Respiratory Protection France, through its Fenzy range, is one of the breathing apparatus business leaders on the market.

Working in close collaboration with fire brigades and industry professionals, has resulted in the design of performing reliable and latest advanced technology apparatus.

Sperian Respiratory Protection France offers a large range of respiratory equipment, recognized for its efficiency by risky professions: 80% of the French fire-fighters are equipped with Fenzy SCBA and more than 30 countries have also chosen them.

The Fenzy X-Pro is a Self Contained Breathing Apparatus gathering the most impressive features to offer the best combination of high comfort and reliability.

The waist belt with 2 sides quick release buckles and the swivelling waist cushion made of Nomex® reinforce the comfort of the wearer and reduce the tiredness during efforts.

The back plate also includes 2 strong

carrying handles.

The Fenzy X-Pro apparatus is fully adjustable and can be really adapted to the wearer and to his movements.

The back plate can be adjusted in 2 positions, and the innovative movable protective foot allows avoiding any risk of deterioration of the high pressure system.

Its back plate is made of carbon fibre loaded polymer heat resistant, and is fully anti static.

The Fenzy X-Pro can be equipped with the multifunction monitoring device Fenzy Angel II: Automatic start at the opening of the cylinder, digital display (duration, pressure, temperature), warnings (pressure, temperature, motionless...), black box...

In case of damage of the Fenzy Angel II, the parameters and alarms are saved in the main unit: all alarms will continue to work.

Fenzy Angel II Telemetry System: Linked with a computer or a PC tablet, you are informed in real time of the situations of your fire brigades entered in action, for a maximum safety.

For more information, please contact:
Sperian Respiratory Protection France
Tel: +33 (0) 1 49 90 79 79
Email: fenzy-info@sperianprotection.com
Website: www.sperianprotection.com

results of the IMS study, underlining as it does our status as the world's leading provider of Video Smoke Detection (VSD) solutions. This is a position we are confident of maintaining with the introduction our IP-based FireVu system with all the potential this offers for remote, off-site, monitoring and more recently the integration of our VSD technology directly into CCTV cameras.

"We have always had a strong export focus and, working with our partners in key markets, have now reached a position where more than 80% of our business is outside D-Tec's home market."

Prestigious projects which are now protected by D-Tec's FM (Factory Mutual) approved VSD include the massive 600 metre wide Royal Airwing Hangar complex at the Dubai International Airport – the world's largest privately-owned aircraft hangar – and the Sydney Harbour Tunnel (SHT) where VSD has been retrofitted to CCTV cameras to protect the 90,000 vehicles which transit the tunnel every day.

James McManus, Research Analyst at IMS Research commented "D-Tec has an impressive installed base for video based smoke detection and has proved that it is a real alternative to traditional fire detection technologies in a wide range of applications."

For more information on D-Tec please visit
www.dtec-fire.com and for IMS Research
log on to www.imsresearch.com

New Skum™ foam delivery systems unveiled

Tyco Safety Products Fire Suppression Group has unveiled a number of groundbreaking pieces of SKUM™ brand foam hardware: the new remotely controllable FJM-EL fog/jet monitor range, and the new HG high-expansion foam generators. They join a line-up of dependable and efficient foam fire protection solutions that are globally favoured for high value, high risk petrochemical, aviation, marine and power plant applications.

The new FJM-EL monitors are powerful additions to the established SKUM FJM range. All three models – the FJM-100 EL, the FJM-150 EL, and the FJM-200 EL – offer exceptional flow performance, incorporate electric motor driven elevation and rotation and solenoid valve operated fog/jet pattern adjustment. However, it is the FJM-EL's remote control operation that really sets them apart as fix-mounted monitors designed for the safe delivery of foam or water, either as a solid jet or a fog pattern.

The FJM-100 EL, with the built-in inductor option, delivers up to 6,000 litres of water a minute to a maximum jet throw of 80 metres, while the FJM-150 EL increases this to 11,700 litres a minute to a distance just short of 90 metres. The top performing FJM-200 EL increases the reach to 120 metres and the flow to an impressive 20,000 litres a minute.

These lightweight and compact balanced-design monitors all incorporate an electrical junction box, low-friction bearings for easy manoeuvrability, and feature corrosion-resistant construction, which makes a major contribution to the monitors' reliability, while minimising the maintenance requirement. All include a manual override option. Other optional components include a control and operating panel, which can be either the standard FJM model or be custom-built, suction hose and valve, and explosion protected EEx (e) and flameproof EEx (de) electrical equipment.

The new HG stationary high-expansion foam generators are part of the HOTFOAM™ system

developed by SKUM primarily for protecting enclosed spaces such as warehouses and distribution centres, flammable material production facilities, tunnels, transformer stations, engine rooms and pump rooms. Located inside the protected space, the HG generator has no moving parts and does not require power in any form, using the air and smoke from the fire itself to generate foam bubbles using a specially-formulated SKUM foam concentrate. The stainless steel HG generators are lightweight – the HG-15 weighs just 5kg and the HG-25 weighs 10kg – easy to install, and deliver 18 and 60 cubic metres of foam a minute.

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Further details on SKUM – the Swedish word for foam, which is pronounced “skoom” – solutions and expertise can be found at www.skum.com, or are obtainable by email on tspmarketing.emea@tycoint.com, by telephone on +46 303 57700

Waterous Introduces New Foam Tank Refill System



The new FoamFill™ foam tank refill system from WATEROUS allows operators to quickly refill foam tanks while the foam system is in operation. Working independently from the foam injection system, FoamFill uses a self-priming pump to make re-supplying foam tanks safer, more efficient and less labor-intensive.

Featuring a 12- or 24-volt electric motor, the pump delivers a minimum flow of 10 GPM (37.8 l/min) and can handle everything from Class A or Class B foam concentrates to emulsifiers, gels and decontamination concentrates. A microprocessor within the system receives input from the tank level sensors and controls the foam concentrate pump output via an 85-amp continuous duty solenoid mounted to the base of the pump.

When the green "Auto" push button on the operator panel is pressed, the microprocessor begins to receive readings from the tank sensors. When the tank is filling, a yellow LED on the panel will flash. A steady yellow LED on the panel will indicate that the tank is full and automatically shuts off the pump or a timer on the system will shut down the pump motor after six minutes of non-stop operation.

The pump body is constructed of bronze, while other components that come in contact with chemicals are constructed of non-corrosive materials. The system also comes equipped with a bronze three-way valve that allows the operator to easily flush the system after each use.

The Waterous FoamFill foam tank refill system is backed by an exclusive two-year warranty.

For more information on the FoamFill foam tank refill system from Waterous, please visit www.waterousco.com or call +1 651 450 5000

NOTIFIER Launches Mass Notification Solutions

Technology Delivers Fast and Widespread Emergency Communication across Large-Scale Facilities, Campuses

NOTIFIER, part of the Honeywell (NYSE: HON) Life Safety Group, is pleased to announce the release of its new Mass Notification solutions product line.

In the event of dangerous and life-threatening emergency, NOTIFIER's Mass Notification systems broadcast live, up-to-the minute emergency information to everyone in a building, campus, or multiple facilities spread across a city, state, even the globe, to help prevent injuries and save lives. NOTIFIER's comprehensive product and technology offering fits a wide range of facility types and applications, including K-12 schools, high-rises, and mass transit hubs, as well as college, university, and manufacturing campuses.

For smaller, standalone facilities that require a simplified Mass Notification solution, the FireVoice 25/50 is an ideal fit; whereas, NOTIFIER's Digital Voice Command (DVC) is engineered specifically for larger buildings and campuses, which often require a greater level of flexibility and sophistication. Multiple DVC systems linked together via the NOTI-FIRE-NET™ intelligent network form a powerful Mass Notification system capable of informing thousands of people throughout a campus about an unfolding emergency. For multinational corporations and government agencies with offices spread across the world, there is NOTIFY-IP, a voice over IP based



technology that can send live, urgent voice instructions anywhere in the world via the internet. NOTIFIER's Mass Notification product portfolio includes a complete line of visual and audible peripheral notification appliances such as amber strobes, LED signs, and speaker clusters.

Flashing amber strobes accompany the voice instructions to visually alert occupants that an emergency exists. Programmable LED signs placed in areas where a large number of people assemble or traverse can communicate information specific to the emergency or display a simple message such as "evacuate." Large speaker clusters can be installed on the exterior of a building or multiple buildings throughout a campus to provide voice instructions to people outdoors in the general vicinity of the buildings.

To learn more about NOTIFIER's Mass Notification solutions, visit www.notifier.com



New AMK-21A Cutter has excellent cutting capability

AMKUS RESCUE SYSTEMS introduces the NEW AMK-21A Cutter with increased cutting capability. The new and improved version of the AMK-21 Cutter offers a new style cutting blade and maintains its UNIQUE 360 degree rotating handle. The design of the blades provides increased cutting capability and a higher NFPA performance level rating. Departments can specify the position of the control valve – left, right or centered in relation to the cutting blades – at the time of ordering. It delivers the cutting power needed for automotive application in a remarkably compact package.

For more information, contact AMKUS 1-800-59-AMKUS or visit www.amkus.com

Orchidee – there is no better way to extinguish

A leading European Manufacturer of Fire Fighting Foams and Powders

The **ORCHIDEE** group, with plants in Germany and France, has experience of more than 50 years in the development and production of fire fighting materials. In France these materials were previously marketed under the name of **CECA™**. In Germany the **pulvex™** powders were formerly manufactured by **TOTAL WALTHER Feuerschutz Löschmittel**.

Modern production technologies, raw materials of superb quality and a highly qualified and trained staff ensure the top performance of the offered fire fighting materials. The impressive range of products is designed to provide the professional fire fighter with the right and most effective extinguishing agent for all known fire hazards with minimum impact on the environment and human exposures:

- **pulvex™** dry chemical powders (ABC, BC and D types)
- **orchidex™** liquid foam concentrates (synthetic AFFF, ARC and ME types, protein and fluoro-protein based types)
- water additives for extinguishers and fixed installations (**INILAM®** for class A fires, **SC-1** for class B fires and premix for class A and B fires)
- **orchidee™** special agents (wet chemicals for class F fires, forest fire agents and BIO foams)

Based on the outstanding fire performance the class-leading products meet national and international standards on the highest achievable rating levels and are variously approved to DIN-EN, NF-EN, UL, ICAO, IMO, GOST and other standards.

The **orchidex™ AFFF** foam concentrates are available as 1%, 3% and 6% versions, with and without freeze protection. All versions are suitable for the use with potable and sea water and provide excellent control and extinction of large non-polar, water-immiscible fuel fires, like hydrocarbons. **orchidex™ AFFF's** can be used with all types of proportioners and foaming devices for forceful and gentle application, including non-air-aspirating nozzles, like hand nozzles or sprinkler heads. The **orchidex™ AFFF's** are well suited to sub-surface and semi-subsurface injection systems for tank protection.

The alcohol resistant **orchidex™ ARC** foam concentrates are designed as 1x1, 1x3 and 3x6, with and without freeze protection and suitable for the use with potable and sea water. They are characterized by their ability to form an aqueous film, which covers quickly water-immiscible hydrocarbon fuel surfaces causing rapid fire extinction and an effective vapour suppression. On water-miscible liquids (e.g. alcohols, esters, ethers, aromatics, ketones, chlorosilanes and other polar

fuels) **orchidex™ ARC** foam concentrates provide a polymeric layer that protect the foam blanket. **orchidex™ ARC** foam concentrates are suitable for low and medium expansion applications. All types of foaming devices can be used, including non-air-aspirating nozzles, like hand nozzles or sprinkler heads. Fast knock-down of the fire and perfect vapour control make **orchidex™ ARC** foam concentrates the ultimate choice for all high risk applications.

The fluorine-free multi-purpose/multi-expansion **orchidex™ ME** foam concentrates are available as 1%, 3% and 6% versions, freeze-protected to -15°C and suitable for the use with potable and sea water. Based on selected surfactants **orchidex™ ME's** achieve excellent performance on hydrocarbon fires of class A and B. Depending on the equipment used, low, medium and high expansion foam can be generated with expansion ratios from 5 to 1000. The cost efficient **orchidex™ ME's** are mainly used by municipal fire brigades and in fixed installations for warehouses or hangars to protect complete areas by flooding these areas with high expansion foam. **orchidex™ ME's** are also the right choice to protect LNG storage facilities. Used in a very low concentration (0.5% to 1.0%) **orchidex™ ME** is a perfect wetting agent for solid combustibles, which are poorly wettable, such as cotton, lignite, coal dust and others.

orchidex™ A is a synthetic fluorine-free foam concentrate specially designed for rapid penetration and wetting of solid combustibles resulting in excellent control and extinguishing of deep-rooted fires in coal mines, wood, paper warehouses, tyre and rubber factories, lumber mills and others. By using **orchidex A** the extinguishing efficiency will be increased up to 8 to 10 times compared to poor water. The strong wetting and extinction effect of **orchidex A** can be even more intensified, when it is applied with CompressedAirFoam (CAF) systems. **orchidex A** is the ultimate water additive to combat large forest fires from the air as well as on the ground.

ORCHIDEE has developed and is marketing a wide range of natural protein based foam concentrates as an economic alternative to synthetic foam concentrates. Besides regular protein foam concentrates designed for maritime, airport and petroleum industry applications **ORCHIDEE** is offering more advanced fluoroprotein foam concentrates with outstanding performance.

Creativity, innovation and competence is the basis for the continuous development of new products, which are oriented and aligned with the current and future demands of the market. **APF**

Additional information about products and services are available by email on:

contact@orchideegermany.com
or
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+33 3 22 41 30 89
Fax: +49 6203 934 150 or
+33 3 22 41 32 88

Det-Tronics releases the MSHA-approved IR methane gas detector

Self-checking device allows no unrevealed failures



DETECTOR ELECTRONICS CORPORATION (Det-Tronics) announced today the release of a new Mining IR (MIR) fixed methane gas detector approved by the U.S. Mine Safety & Health Administration (MSHA) to their standards. Intended for installation in underground mines, the MIR combustible gas detector uses an infrared (IR) light beam to detect and accurately measure methane gas concentration, while continuously performing self checks so there are no unrevealed failures. Det-Tronics is part of UTC Fire & Security, a unit of United Technologies Corp. (NYSE:UTX).

"In support of the mining industry's commitment to total safety, we developed a fixed methane gas detector that remains sensitive and accurate even after prolonged exposure to oxygen-depleted environments and in areas with high levels of hydrocarbon gas," said Mike Bragg, Det-Tronics Product Manager.

User benefits include reduced calibration and maintenance requirements, long life, and low cost of ownership. For ease of installation, the MIR is factory-calibrated and is shipped ready to install with pre-fitted MSHA-approved cable glands.

To reduce maintenance, the detector's modular design provides field-replaceable optics-protection filters. In addition, the transmitter display module provides an easy-to-read digital LCD readout indicating 0-5% by volume detected gas concentration.

The MIR easily integrates into new or existing systems via the standard 4 to 20 mA analog output and optional alarm/fault relay-output package.

For more information, please contact:
Detector Electronics Corp
A UTC Fire & Security Company
Tel: +1 952 833 8661
Website: www.det-tronics.com

Akron Brass Releases Wave of New Products at FDIC 2008

Driven by customer feedback and insight, AKRON BRASS introduced an exciting variety of new products during the Fire Department Instructors' Conference (FDIC) 2008!

For use with their impressive DeckMaster™ monitor, a new Style 3406 Electric Riser is now available from Akron. Using an innovative 3-piece design, this new Electric Riser is extremely compact when nested such that it fits very well within today's crowded pump module areas. For a combined 38-inches of deployed extension, the Electric Riser provides an additional 12-inches of elevation to the 26-inches of the DeckMaster.

When using gel agents for urban interface applications, Akron Brass has a new Style 1230 1-inch Self-Educting Forestry Nozzle that is ideal. Made of heavy-duty but relatively lightweight aluminum, it is capable of flowing 15 gpm @ 100 psi. Designed for easy cleaning and with a check valve in the eductor to prevent water from entering the gel, the Style 1230 is optimally designed for use with these agents.



For aerial master stream use, Akron introduced their new Style 5179 Nozzle with Shut-Off. With variable pattern control, this creative design has a shut-off incorporated directly within the master stream nozzle itself. By doing this, it effectively eliminates the need for a butterfly valve on an aerial waterway.

With the Extenda-Lite® family of scene lighting products, Akron now has a

new series of cab brow mounting options for their popular low profile Beta lighthouse. This includes a brow shield option to help reduce glare through the windshield and contoured universal brackets for new apparatus cab designs. Additionally, Akron showed their new locking collar design for their telescopic poles and new Manual Mast for scene lighting with trailers, utility vehicles, and skid units.



To add to their ever growing portfolio of electric rewind reels, Akron displayed several new and innovative products. This included their recent Compact Cord Reel and Low Profile Booster Hose Reel as well as new configurations of their Hydraulic Hose Reel line. With compartment space always at a premium on apparatus, these reels provide great opportunities to fully utilize these areas for additional critical equipment.

Many other new items were shown including their new Roof Hook hand tool and Valve Controller lines as well as the growing family of Diamondback™ LED lights.

For more information, contact your local authorized distributor or the Akron Brass Customer Service Department at +1 800 228 1161 or visit www.akronbrass.com

Haztec achieves The Queen's Award For Enterprise: International Trade 2008



HAZTEC are proud to announce our achievement of the UK's most prestigious business award which is presented annually to a limited number of elite companies:

THE QUEEN'S AWARD FOR ENTERPRISE: INTERNATIONAL TRADE 2008

Although only founded in 2002 most of our management and staff have many years

experience in the design, manufacture and supply of Vehicle Warning Equipment ranging from Lightbars to Electronic Siren Systems which we supply to Emergency and Municipal Services throughout the world.

The Queen's award is an accolade to our success and in the quality of our products along with the efficient and prompt service we strive to give to our customers.

As Bryn Tennant CEO of Haztec commented, 'This award emphasises the meaning of our registered slogan 'GLOBAL WARNING'!

For more information, please contact:
Haztec International Ltd
Tel: +44(0)113 202 9115
Email: info@Haztec.Biz

HAZTEC
GLOBAL WARNING



A Beam Detector for all Installations

When it comes to optical beam smoke detectors it is vital that the correct beam type is selected for a specific application. No other company has the experience, or the product range, of Fire Fighting Enterprises Ltd. With well over 600,000 beams installed, including in some of the World's most prestigious buildings, it is clear that the FireRay series of projected beam detectors is the model of choice for both installers and specifiers.

The model range comprises:

The FireRay 2000 end-to-end beam detector, a well-established product noted for its ruggedness, small detector head size and low level control. The small size of the transmitter and receiver mean



that it is ideally suited to projects where a low visual impact is required, such as buildings of historical importance. The FireRay 2000 has CPD, EN54 and UL certification plus others. A typical installation is Hong Kong International Airport where the beams do not interfere with the stunning Norman Foster design.

The FireRay 50/100 reflective beam detectors were amongst the first purpose built reflective products. The big advantage with this product is



that both the transmitter and receiver are in the same discrete unit, which reduces the amount of cabling required thus saving time and significantly reduces installation costs. The FireRay 50/100 reflective has CPD, EN54 and UL certification plus others. This beam has been used in many prestigious locations including the British Museum and the Foreign Office in London.

The FireRay 2000 Eexd is the only ATEX 94/9/EC

certified beam detector available. Its flameproof construction and robust housing make it particularly suitable for use in hazardous locations where



other types of smoke detection would be unsuitable. Typical applications are oil refineries, petrochemical plants and warehouses for the storage of flammable liquids. These beams have been successfully used in ordnance bays in the Falkland Islands and in some marine applications.

The new flagship model of the range is the innovative FireRay 5000 Auto-Aligning Infra-Red Optical Beam Smoke Detector. This is a completely



new design incorporating pioneering technology that addresses the needs of both user and installer. Key features include: Easifit First Fix system; LASER assisted alignment, *AutoOptimise* automatic beam alignment and a 2-wire interface from the detector to the controller. The FireRay 5000 boasts certification from UL in addition to LPCB, VdS, CPD & EN54:12, with more international approvals on the way, and is protected by British Patent Application 2426323 and by International Patent Application PCT/GB2006/1799 pending.

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Further details can be found
our website: www.ffeu.com

MFB and CFA adopt Turnout Gear



After five years of development and cooperation, the Melbourne Fire Brigade (MFB), Victoria Country Fire Authority (CFA), and United Firefighters Union of Australia (UFU) have completed the design of their new generation of structural firefighting kit. After extensive testing, wear trials and several redesigns, PBI Gold flame resistant fabric was chosen as the best outer shell solution.

The PBI fabric is being woven by MELBA Industries, Thomastown, Victoria. MELBA is the only approved weaver of PBI fabrics in Australia. "The move to PBI has been driven by the success of this fibre in many fire services all over the world," according to Rob Walsh, MELBA's Technical Textiles Account Manager. "It is recognized as an exceptional fibre for flame and radiant heat protection. There has been a natural progression for the many fire services in Australia to utilise the PBI gold due to its performance under the harshest of conditions," according to Walsh.

Peter Whelan, Director of Technical Services for the MFB states, "The Metropolitan Fire &

Emergency Service Board, after an extensive evaluation process, including firefighting field trials, hot fire scenario testing, metabolic heat evaluation at the University of Wollongong and British Textile Technology Group (BTTG) testing in the UK, determined that PBI Gold was the fabric of choice for its new generation of Firefighting Protective Clothing. Firefighter field trials indicated a strong preference for PBI Gold over the other protective fabrics and the BTTG testing in the UK confirmed firefighter perceptions of superior burn protection."

"The MFB will be rolling out three sets of PBI Gold Personal Protective Clothing over the next 12

For more information, please contact:

Walter Lehmann
walt.lehmann@pbiproducs.com



PBI Gold for New



months to over 1600 firefighters," according to Whelan.

Stewart & Heaton Clothing Company PTY Ltd of Preston, Victoria, was the successful contender for the MFB and CFA tenders. "Stewart & Heaton Clothing, after a five year tender evaluation process by the MFB, was nominated to provide all Victorian Firefighters with new generation firefighting ensembles," according to Steve Molloy, S&H National Manager of Protective Apparel. "These ensembles have been selected to be manufactured from the world class PBI Gold

shell fabric for use in the manufacture of its new structural fire fighting ensemble. Throughout the testing and trialing process PBI gold demonstrated that it met the performance requirements of Australian Standard 4967:2006 and received endorsement from structural fire fighters as one of the products selected to protect them from the inherent dangers of their job."

MFB garments are being manufactured now and will be distributed over the next year to all full time fire fighters. All full time firefighters in CFA will receive three sets of PBI gear from S&H over

"We at PBI Performance Products are thrilled to add the MFB and CFA to our growing family of firefighters in Australia and the Asia Pacific market"

fabric. After a lengthy evaluation, the MFB and CFA in conjunction with ourselves and based on the results obtained through testing as outlined within the Australian and International Standards (inclusive of Thermoman manikin testing) have chosen PBI Gold."

Molloy went on to state that "Stewart & Heaton are delighted to be working with PBI Performance Products to develop this new generation of structural turnout ensembles for the Australian market."

CFA's Neil Bibby, Director of Community Safety in Mt. Waverly, says "The CFA undertook an exhaustive range of scientific, operational and destructive burn testing to identify a suitable outer

the next year and all other SCBA qualified volunteers in the CFA will be offered a choice of PBI or Nomex IIIA outer shell fabrics.

"We at PBI Performance Products are thrilled to add the MFB and CFA to our growing family of firefighters in Australia and the Asia Pacific market," states Walt Lehmann, Vice President of Marketing and Sales for PBI Performance Products, Inc. "Adelaide and SAMFS have been using PBI for several years and the entire New Zealand Fire Service has been using PBI to protect their fire fighters for over ten years. PBI evaluations and wear trials are progressing throughout the A-P basin and we are extremely pleased with all of our supplier partnerships in the region."

APF

It's This Simple:

C6 Fluorosurfactants + C6 Foam Stabilizers

= BEST AR-AFFFs and AR-FFFPs

— "Best AR-AFFF and AR-FFFP Agents" meet the most stringent fire performance specifications with the lowest fluorochemical content. Fluorochemicals in "Best Agents" should neither be derived from nor degrade into PFOA or its higher homologs. In addition, "Best Agents" meet environmental requirements proposed by US and foreign regulatory agencies.

— ONLY Dynax offers a family of C6 Fluorosurfactants and C6 Foam Stabilizers for the production of low-viscosity 3x3, 1x3 and 1x1 AR-AFFF and AR-FFFP agents meeting "Best" environmental and fire performance requirements. The same applies to AFFF and FFFP agents derived from Dynax C6 Fluorosurfactants. All Dynax C6 Fluorochemicals are non-flammable and free of corrosive halide salts.

Dynax C6 Fluorosurfactants and Foam Stabilizers

Dynax Product	Ionic Type	Agent Application Guide			
		AFFF	AR-AFFF	FFFP	AR-FFFP
Fluorosurfactants					
DX1030	Anionic	●	●	—	—
DX1040	Anionic	●	●	—	—
DX1080	Nonionic	●	●	●	●
DX1090	Nonionic	●	●	●	●
DX1025*	Anionic	●	●	—	—
Foam Stabilizers					
DX5011	Anionic	—	●	—	●
DX5022	Anionic	—	●	—	●
DX5065**	Anionic	—	●	—	—
DX5066**	Anionic	—	●	—	●

* Blend of Fluorosurfactants ** Blend of Fluorosurfactants and Foam Stabilizers

US EPA PFOA Stewardship Program

By 2010: 95% Reduction of facility emissions and product content level of PFOA, precursor chemicals that can break down to PFOA and related higher homolog chemicals.

By 2015: Elimination of PFOA, PFOA precursors and related higher homologue chemicals from emission and products.

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AFFF Industry in Position to Exceed Environmental Goals

By Tom Cortina

FFFC

and
**Stephen
Korzeniowski**

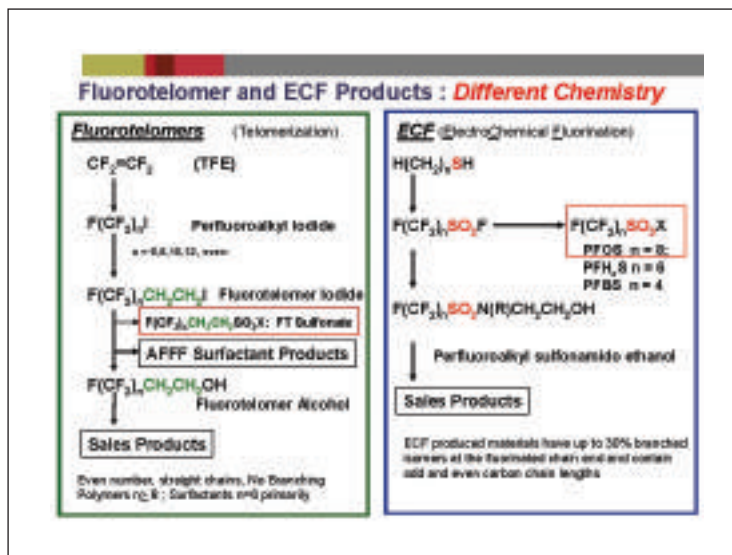
DuPont

With the recent announcements by major fluorochemical manufacturers of new short-chain, C6 (six fluorinated carbons) fluorotelomer-based products, the AFFF industry is in position to exceed the goals of the EPA global stewardship program.

This program has the goal to work toward the elimination of PFOA and related higher homologue chemicals from products such as AFFF and from plant emissions by 2015. This is an important set of milestones considering that since the announcement in 2000 by 3M of environmental concerns related to the use of PFOS-based products including foams, the AFFF industry has worked to address these issues in a responsible manner. Evidence of this can be seen in the smooth transition from PFOS-based to fluorotelomer-based foams, the formation of the Fire

Fighting Foam Coalition (FFFC) as a focal point for cooperation with regulatory authorities, and the industry's recent focus on the containment and treatment of foam discharges. When the PFOS issue first became public there was speculation that environmental concerns could eventually lead to a ban on the production of fluorosurfactant-based fire fighting foams. Now it appears that the foam industry will be able to exceed its environmental goals with C6 fluorotelomer-based fluorosurfactants that provide the same fire protection characteristics but with reduced environmental impacts.

Figure 1. Fluorotelomer-based and PFOS-based Chemistry



Fluorosurfactants are a key ingredient

Historically, most of the environmental concern related to fire fighting foams has focused on aquatic toxicity and residual foaming, which can be a concern for local waterways and sewage treatment systems, and are common problems for all foams¹. Over the past 10 years the focus has shifted to the fluorinated surfactants (fluorosurfactants) that are a key ingredient in aqueous film-forming foams (AFFF). Fluorosurfactants provide AFFF agents with the required low surface tension and positive spreading coefficient that enables film formation on top of lighter fuels. It is this film formation capability that gives AFFF its name and its effectiveness against flammable liquid fires.

3M used a unique process to manufacture the fluorinated components of the fluorosurfactants contained in its AFFF formulations. The process is called electrochemical fluorination (ECF), and fluorosurfactants produced by this process both contain and degrade into a chemical known as PFOS (perfluorooctyl sulfonate). Other competitive manufacturers use a process called telomerization to produce the chemical components of the fluorosurfactants contained in AFFF agents. Chemicals produced by this process are generally referred to as fluorotelomers.

Over the past several years there has been a substantial shift from PFOS-based AFFF agents to equally or more effective AFFF agents containing fluorotelomer-based fluorosurfactants (see Figure 1). With the withdrawal of the PFOS-based products due to their persistence, bioaccumulative and toxic properties (beginning in May 2000) and their subsequent regulation by various national governments, makers of fluorotelomer-based products began more intensive study of the toxicology and environmental fate of their products.

Environmental impacts of fluorosurfactants

A primary debate about fluorotelomer-based products centers on the perceived similarity to PFOS, the presence and/or generation of perfluorocarboxylic acids (PFCAs) such as perfluorooctanoic acid (PFOA), and the ultimate breakdown products of these surfactants.

First and foremost, fluorotelomer-based AFFF

agents do not contain or degrade to PFOS, and contain 30-60% less fluorine than PFOS-based AFFF. They are not made with PFOA or PFCAs. The predominant breakdown product from the six-perfluorinated carbon (C6) based fluorotelomer surfactants is commonly referred to as the 6:2 fluorotelomer sulfonate (6:2 FtS)². They may also contain trace levels of PFOA and the C6 acid, perfluorohexanoic acid (PFHxA). The highlighted red box on the left side of Figure 1 calls out the 6:2 FtS structure (where n = 6). Although there have been numerous articles and conference presentations that

purport the 6:2 FtS to be a PFOS analog (sometimes incorrectly referred to as H-PFOS), the scientific data do not support this allegation. The physical, chemical, biopersistence and toxicological properties of 6:2 FtS are not similar to PFOS.

Toxicology

A second part of the debate seems to focus on the potential hazards of PFHxA and the 6:2 FtS. These two compounds can be both contaminants in the final products as well as potential degradants once the AFFF agents are used. Extensive data on PFHxA were presented at a US Environmental Protection Agency (EPA) PFOA Information Forum in June 2006 that gave a very favorable initial toxicology (hazard) profile³. Additional information was presented in September 2007 at a major foam conference in the UK (Reebok) that further supported the favorable toxicology profile of PFHxA⁴. Preliminary data were shared on four major toxicology end points: sub-chronic toxicity in rats, reproductive toxicity in rats, developmental toxicity in rats, and genetic toxicity. It was noted at this conference that PFHxA was neither a selective reproductive nor a selective developmental toxicant. In addition it was clearly shown to be neither genotoxic nor mutagenic. Combining these data with those presented in June 2006 provides significant evidence that this particular end product has a low hazard profile based on current data.

Based on recent groundwater studies, the 6:2 FtS has been shown to be the likely ultimate degradation product of the C6 fluorotelomer-based surfactants used in today's AFFF agents. The screening study cited above (Figure 2) indicated that the 6:2 FtS had a low relative biopersistence potential. The 6:2 FtS had a high NOEC (no observed effect concentration, the higher the NOEC the lower the concern for toxicity) in the 90-day early life stage trout study. Results presented at the Reebok foam conference provided preliminary new results on environmental effects as well as bioconcentration (BCF) and bioaccumulation (BAF) in rainbow trout. Although the data were preliminary in nature, the results were clear and compelling. Moreover both the BCF and the BAF values suggest low concern for bioaccumulation from water or diet. The data strongly suggested that 6:2 FtS is not bioaccumulative according to



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DuPont science pioneered today's short-chain repellents and surfactants. Our new line of high-performance DuPont™ Capstone™ products meet the demands of a global marketplace—giving you the freedom to innovate.

We're a team ready to help you create customized solutions to help your business grow. As the global manufacturer of innovative short-chain compounds, DuPont has a robust supply of Capstone™ products, so you can be confident your production lines will run smoothly—wherever you are.

If you're interested in learning how DuPont™ Capstone™ products can help transform your business, contact us.

DuPont Surface Protection Solutions

www.capstone.dupont.com

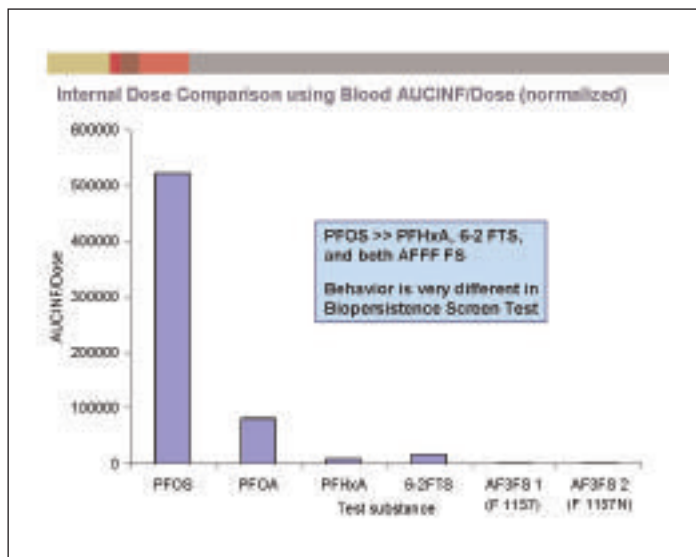


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Figure 2. Biopersistence Screening Study Results



published regulatory criteria and affirmed that it does not behave like PFOS.

Biopersistence

The results of a 6:2 FtS biopersistence screening study were also presented at the Reebok foam conference. The data presented are shown in Figure 2 (publication in preparation). This screening study involves oral dosing of male rats for 10 days followed by an 84-day recovery period. The study determined total organic fluorine levels in plasma, liver, and fat. It provides a screening measure of what toxicologists refer to as biouptake and bioclearance. The AUCINF, or area under the curve integrated to infinity, provides a relative integrated measure of the absorbed dose of the compound studied. A compound that is absorbed and quickly eliminated or is simply not absorbed will have a low relative AUCINF. It is very clear from Figure 2 that the 6:2 FtS, the C6 acid (PFHxA), and the two commercial fluorotelomer-based fire fighting surfactants have extremely low values when compared to PFOS. In this study, PFOA is also lower when compared to PFOS.

PFOA global stewardship program

Although they are not made with PFCAs, fluorotelomer-based fluorosurfactants may contain trace levels of PFOA. Fluorotelomer producers are working toward the elimination of trace levels of PFOA, PFOA precursors, and related higher homologue chemicals from finished products by 2015 as part of the US EPA global stewardship program. Under the program, EPA asked fluorotelomer producers to make two commitments:

- Reduce by 95% by 2010 (based on a 2000 year baseline) facility emissions and product content levels of PFOA, precursor chemicals that can break down to PFOA, and related higher homologue chemicals.
- Commit to working towards elimination of PFOA, precursor chemicals that can break down to PFOA, and related higher homologue chemicals from emissions and products by 2015.

The recent announcements by fluorochemical manufacturers of the introduction of short-chain fluorotelomer products means that the AFFF industry is in position to meet the EPA goal well in advance of the 2015 target date.

Fire Fighting Foam Coalition

In May 2001, AFFF and fluoro-surfactant manufacturers met in Washington DC with representatives of the US EPA, the US military, and major foam users to discuss the

fallout from 3M's decision to stop production of PFOS-based AFFF due to environmental concerns. It quickly became clear that users and agency staff did not fully understand the differences in chemistry between PFOS-based and fluorotelomer-based AFFF agents. It was also evident that speculation about the future regulation of AFFF agents was causing problems for the industry. As a result of this meeting, the Fire Fighting

Foam Coalition (FFFC) was formed to ensure that accurate information about fluorotelomer-based AFFF agents is disseminated to appropriate audiences.

FFFC is a non-profit corporation that represents the AFFF industry's interests on all issues related to the environmental acceptability of fire fighting foams. The coalition provides a focal point for industry technical reviews, development of industry positions, and interactions with the EPA and other relevant organizations. Members of are AFFF manufacturers, fluorosurfactant manufacturers, and distributors.

FFFC has provided extensive information on AFFF to environmental agencies in the US, Europe, and Canada that includes the following:

- Amount of fluorosurfactant actives used in the manufacture of AFFF in the US
- Chemical structure of the fluorosurfactants used in major fluorotelomer-based AFFF formulations
- Mechanics of film formation
- Groundwater monitoring data from US military fire training areas
- U.S. Inventory of PFOS-based and fluorotelomer-based AFFF
- Overview of the different types of foams, the market channel for their distribution, and the environmental fate once they are used
- Aquatic toxicity of fire fighting foams

Existing stocks of PFOS foams

Although production of PFOS-based foams ended in 2002, significant stocks of PFOS-based foams are still in service in many industries throughout the world. A study by Hughes Associates of AFFF inventories in the US showed that there were 4.5 million gallons of PFOS-based AFFF concentrate in stock in 2004⁵. While US regulations do not restrict the use of these stocks, regulations in Europe and Canada would ban the use of existing stocks of PFOS-based foams within 3-5 years.

A European Union directive on PFOS was published in December 2006 that requires existing stocks of PFOS-based foams to be removed from service by June 27, 2011. To facilitate tracking and adherence to the directive, EU member states must provide the European Commission with an inventory of existing stocks of PFOS-based foam



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agents by December 27, 2008.

A proposed regulation was published by Environment Canada in December 2006 that would require existing stocks of PFOS-based AFFF to be removed from service 5 years after the regulation comes into force. During the 5-year exemption period, those stocks could not be used for testing or training purposes. (In other words, they could only be used to extinguish emergency fires.) The final regulation should be published this year, which means that the restrictions on PFOS foams would begin in 2013 or 2014.

Fluorine-free foams

As a result of the concerns raised by the PFOS issue, foam manufacturers continue to evaluate many types of potential products that do not contain fluorosurfactants, but efforts to date have not yielded working products with fire performance equal to film-forming foams. Some fluorine-free foams can provide an alternative to AFFF in some applications, but they are not currently able to provide the same level of fire suppression capability, flexibility, scope of usage, and independent validation. A recent paper from the University of Newcastle that shows that even the best available fluorine-free foam would need to be replenished three times as often as AFFF to provide the same level of fire protection⁶.

Fluorine-free foams are often championed as "environmentally-friendly" alternatives to AFFF. Although such foams may not contain fluorine, their environmental profile related to biodegradation, acute toxicity, chemical oxygen demand (COD), and biochemical oxygen demand (BOD) is typically no better than fluorine-containing products and in many cases is not as environmentally responsible in use as AFFF. A recent study of commercially available fire fighting foam agents indicates that fluorine-free foams are at least an order of magnitude higher in aquatic toxicity than AFFF agents⁷.

FFFC assists in wastewater treatment

Another issue that has been brought to the forefront in recent years is the containment and

treatment of wastewater from foam discharges. FFFC and its member companies have been actively involved in this issue, and recently provided assistance to an oil refinery in Missouri that was looking for help in dealing with a wastewater disposal issue. The company had a fire at a bulk plant that resulted in 1.1 million gallons of wastewater containing gasoline, diesel fuel, and fire fighting foam agents used to extinguish the fire.

FFFC put the company in touch with one its members, Martial Pabon of DuPont, who had done research on the use of activated carbon to treat water that contained fluorosurfactants similar to those used in AFFF. Based in part on the information provided by Dr. Pabon, the company successfully treated 1.1 million gallons of wastewater in 15 days using granular activated carbon (GAC) in a trailer-mounted system with two pressure vessels each containing 5,000 pounds of GAC⁸. Dr. Pabon has done additional research on other methods to treat wastewater, including nanofiltration, ultrafiltration, and reverse osmosis⁹.

Conclusions

Fluorotelomer-based AFFF agents are the most effective agents currently available to fight flammable liquid fires in military, industrial, and municipal settings. They do not

contain or breakdown into PFOS and are not likely to be significant sources of PFCAs. They do contain fluorosurfactants that are persistent, but are not generally considered to be significant environmental toxins. AFFF and fluorosurfactant manufacturers are in position to meet the goals of the EPA global stewardship program years ahead of the target date with a new family of fluorosurfactants that provide the same fire protection characteristics with reduced environmental impacts. **APF**

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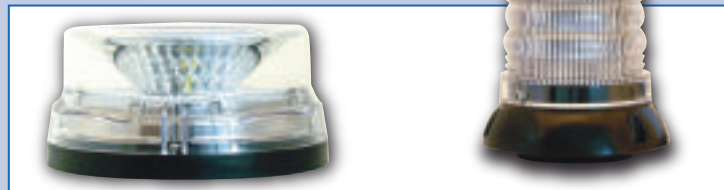
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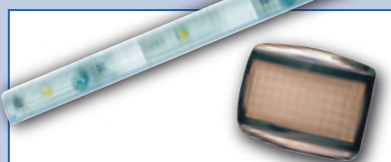
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Warning Lights and Lightbars – from Bulbs to LEDs

Warning lights as fire-fighters well know are a vital necessity to help safeguard the vehicle and crew responding to an incident. They assist in helping to clear the traffic as well as alerting oncoming traffic of the existence of vehicles and any stationary crew at the scene of the incident.

By Bryn Tennant

Over the years the effectiveness of the original types of warning lights has been reduced for a number of reasons. There are today many more users of warning lights along with the increased use of road lights, Neon and/or other types of illuminated advertising signs. These additional lights have all made traditional Emergency Vehicle Lighting less noticeable.

To try to maintain the effect of warning lights over the years vehicle lighting has steadily evolved from a single on/off flashing light to rotating beacons and onwards to today's highly visible Lightbars.

The first Lightbars introduced over thirty years ago had rotating tungsten sealed beams coupled with mirrors to multiply the lighting effect. Sealed

beams were gradually replaced by halogen rotators giving an increased light intensity output and still today this approach is still a popular and frequent choice for certain economical warning needs.

Then in the 90s came the introduction of strobe lights for warning purposes. Strobe brought a higher technology solution. Strobe significantly reduced the battery drain associated with halogen lights along with the opportunity to be able to programme a variety of flash patterns aimed at making warning lights even more effective and attention getting. However, strobe still had some weaknesses to overcome. Strobe lights because of the very short "ON TIME" or burst of light tend to lose their effectiveness during daylight hours. Also

*Generation3 LED
Lightbar*



the burst of energy is in a colour range that washes out colour and all colours can appear to be similar to daylight.

The latest innovation is in using LEDs for warning lighting. LEDs provide a virtually instant on-time and the visual colour will be pure since LEDs produce light in only in a narrow band. So Reds stay Red, Blues stay Blue. LEDs started with what the industry calls Generation 1 LED's. They have only distribution optics and are very directional and had limited intensity except at HV. These LEDs were quickly superseded by much improved and rugged Generation 2 LEDs which had higher outputs and also contained both distribution and collection optics and so were able to provide a larger viewing angle.

The latest LED lights are far more effective during both day and night than either halogen or strobe, although this can depend on the quality and output of the particular LED's.

Naturally following Generation 2 came Generation 3 LEDs. The Generation 3 LEDs can produce a much larger light output than Generation 2 and are more versatile and capable of larger viewing angles when coupled with appropriate optics.

Although Generation 3 are currently the ultimate in performance for led warning lights they do produce more heat than Generation 2 so it is necessary to have suitable heatsink capabilities built into the lamp assembly. Generation 2 LEDs are still extensively used as a cluster of LED's. When used this way Generation 2s can produce a

light output almost equal to a few Generation 3 with as long a life yet are more economical in certain colours and configurations.

The latest LED lights are far more effective during both day and night than either halogen or strobe, although this can depend on the quality and output of the particular LED's. There are some poor quality LED lights which give very little light output and consequently could be a more of a danger than an asset to the emergency vehicle. When they are used a driver believes his lights are giving some protection by alerting other road users when in fact they can hardly be seen.

Flashing headlights are still a very good means of warning although they give little side warning. However, further developments in LEDs and in the culmination optics now mean that directional LEDs can produce both a vivid front warning coupled with a 180 degree wide angle warning to give excellent side protection. These are particularly good when used in front grille applications on Fire Trucks which tend to have high mounted Lightbars. The high LightBar is great at warning at a distance but has less value in urban congested areas. Wide angle type of directional LEDs lights are also very good for the sides and rear of the Fire Tender as again they can give a full 180 degree warning angle.

The change by many services in many countries from halogen to strobe and more recently to LED has been very significant. LED products have seen an enormous surge firstly in directional warning lights where they are able to be packaged much smaller and installed without the cutting of bodywork and continuing in to Lightbars.

There are a variety of reasons for this not least the effectiveness of LEDs but also the longevity and reliability with both Generation 2 and Generation 3 LEDs expected to last a minimum of 50,000 hours but more likely 100,000 hours.



Dedicated generation3 LED Lightbar

Another benefit of LEDs is their much reduced power requirement resulting in the ability to keep the warning lights operating for long periods of time without keeping the engine running. This saves not only fuel and the environment but also extends the life of engine components such as alternators. These are very big advantages and ones which help to justify the extra costs involved in LED products.

This is also reflected in the lack of down time and costs due to their reliability compared with halogen and strobe products which although reliable the cost to change a halogen bulb and with current health and safety requirements effectively preventing an engineer climbing on to a high vehicle such as a Fire truck costing more time and money erection suitable ladder and platform equipment.

Some countries do have very strict and closely monitored requirements for Emergency Vehicle Lighting. In Europe for example and although not compulsory many countries specify the regulation ECE R65 which is a strict test for light output intensity, flash speed, correct colour spectrum and lighting angles. The testing also includes an environmental test for both water and dust ingress and effect. All of which should go to ensure that the warning lights are sufficient, efficient and reliable for the important job they do of protecting both vehicle and personnel. Some developing countries however, simply accept a flashing light no matter how bright or how effective it is.

Colours of warning lights for the various Emergency Services vary throughout the world with some Fire Services using Red some others Blue, while still others use Blue/Red and yet others Amber. Some also combine in either white or green lights.

There is some logic for each service to have their own individual recognition and a logical

approach would seem to be that Police should be Blue – while Fire could be Red and Ambulance could be Green.

However, in some countries a red light shown to the front is illegal as is a white light to the rear although these are laws dating back to the 1920s and a change could be justified at least in relation to red warning lights on Emergency Vehicles and in particular on Fire vehicles.

Around twenty years ago in Australia when the Police changed to combined Blue/Red warning lights the Fire Service also followed suit which may have been a missed opportunity to give them their individual warning identity.

Fire Services in some other countries in Europe use amber which would seem totally impractical with the large amount of amber warning lights used on a variety of vehicles from Road Sweepers to Breakdown-Recovery Vehicles to even vans and tipper trucks.

The coming years will no doubt see even more progression in the capabilities and usage of LED products in helping to provide a safe environment for fire-fighters.

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The New Standard EN 443:2008 and the new Dräger HPS 6200 Helmet

Increased Safety During Missions

Fire fighters worldwide risk their lives every day. No mission is like the other. Therefore the protective equipment has to comply with the highest standards. At the same time the comfort for the wearer has to be maximised. DRÄGER researches new technologies in the area of fire fighter helmets and develops products which reduce the risk for the action forces as much as possible. Countless technical improvements were realised for this product range. Dräger is able to establish new standards in regard to safety at work and in extreme situations due to long time experience and know-how.

New helmet standard + innovative technologies = Dräger HPS 6200

The new fire fighting helmet Dräger HPS 6200 is a further development and optimisation of the well-known Fire Fighting-Helmet Dräger HPS 6100.

With the helmet shell made of high temperature resistant Duroplast-material and the new: on both sides coated, amber-tinted visor (also with high temperature resistance) made of Polysulfon material, in chin length which protects the whole face. The new helmet also comes complete with an extended, adjustable velcro chin-strap and heat-resistant, ergonomic plug-in fastener.

A wide array of accessories are available as well as a large area on the front of the helmet for markings/badges which allow the customisation of the helmet according to the individual needs.

Easy connection with Panorama Nova-Supra and f2-Supra-Adapter and the new full face mask Dräger FPS 7000 are possible with the new patented adapters S-fix and Q-fix. The Polysulfon-visor in chin length is approved in accordance to EN 14458 (as face protection).

The helmet itself is approved according

to the new standard EN 443:2008 and is the lightest helmet in this category.

The new standard EN 443:2008 consists of extended safety requirements for additional improved protection of fire fighters on a mission. Dräger have tested their own fire fighter helmets meticulously. The safety requirements were not only fulfilled – the results have impressively demonstrated the safety and quality of the Dräger fire fighter helmet HPS 6200. Some of the tests carried out include: IMPACT and Shock Absorbance. This involved an iron ball weighing 5kg being dropped from a height of 2.5m onto 5 different test points on the helmet. The maximum force in the tests should not exceed 15,000 Newton. The HPS 6200 provided the wearer of a force of less than 12,000 Newton.

The Fastening System: Effectiveness and Strength

The Chinstrap is tested for strength by stretching it with the help of a small motor until a force of 250 Newton is reached. The results for the HPS 6200 showed that the helmet stayed firmly on the wearers head, the chinstrap did not break and when a force of 750 Newton was reached, the clip automatically unfastened so as to prevent strangulation.

Flame Engulfment

A dummy was placed in an oven kitted in bunker gear as well as the HPS 6200 hel-



met and was subjected to 90°C heat for 20 minutes. A flame engulfment of 1000°C followed for 10 seconds. The test would only allow a pass if the helmet burned for 5 seconds or less. The Dräger HPS 6200 did not burn and the inside of the helmet was untouched.

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Cromwell FR2 fire helmet performs dual role

Operational demands on the Fire and Rescue Services have changed dramatically over the past decade, raising the need to provide increased levels of protection and comfort for personnel involved in fire and rescue operations.

In the case of helmets it is generally accepted that less than a third of all 'call outs' to the Fire and Rescue Services require the need for a structural fire fighting helmet. Other incidents not requiring this type of helmet include road traffic accidents, woodland fire fighting, water rescue, urban search and rescue and industrial incidents such as confined space rescue operations.

The base helmet, the Cromwell ER1,

is designed for emergency and rescue operations that do not require a structural fire-fighting helmet, making it also suitable for use by paramedic, water rescue and civil defence personnel. The helmet has an integral internal visor, and can be fitted with accessories such as ear defenders and a full faceshield. In addition, the helmet can be configured for specialised applications such as heli-deck, coastguard, air sea rescue and public security operations.

The Cromwell FR2 with an integral full face shield, has an internal clip arrangement enabling it to be fitted to the ER1 base helmet in seconds, providing additional heat, flame and impact protection to the



wearer when undertaking structural fire fighting operations. The FR2 can also be fitted with integral communications, neck capes and SCABA facemask fixing points.

The Cromwell helmet is manufactured using the latest moulding techniques and materials, and was designed with reference to international anthropometrical data relating to male and female emergency personnel across a range of ethnic groups, establishing that the helmet is suitable for international use

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MSA GALLET F2X-TREM

The fire and rescue helmet F2 has been used for many years in all over the world, more recently by the rescuers in China because of the last terrible earthquake (we can see this helmet on pictures in last newspapers worldwide).

MSA GALLET has improved this helmet with the new F2 X-TREM, compliant with EN 397 and adapted to all extreme applications: forest fires, traffic rescue, rescue in hazardous environment and natural catastrophes, industrial risks.

The F2 X-TREM is a quite sizeable, complex set-up and comfortable helmet, and it is still one of the best all-round rescue helmets on the market.

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Pacific Helmets

Safety helmets designed specifically for paramedics have been around for at least 17 years, but new and interesting designs now available are taking the Ambulance world by storm. Many models are now leading the way for innovation for Structural Fire Helmets rather than being simply modified versions.

PACIFIC HELMETS design team is at the forefront of the development of these helmets. The company specialises in manufacturing helmet products that not just meet safety Standards, but set new levels of protection, styling, comfort and convenience. Until recently helmets in ambulances have stayed pretty much unused except in really serious incidents where everyone is wearing a helmet, but now there is much greater recognition that wearing a helmet in the moving ambulance also has considerable merit.

There are numerous reports and pictures of ambulance accidents, and the consequences of these are not pretty. However, all the evidence points to the fact that paramedics are best protected when wearing their helmet at all times. While other parts of our bodies can recover from injuries, head and face injuries can be very serious, and frequently life threatening or have very longterm consequences.

Recent moves in the USA in particular are bringing this concern to the fore. Just as in the UK and other European states, there is no specific Standard for para-medics helmets, USA medics and other safety conscious groups are pressing onwards with discussions intended to ensure a specific safety Standard is in existence to cover paramedic helmets. This Standard should ensure that helmet designs cover both emergency operations with use in moving ambulances and other USAR operations.

With these requirements in mind, Pacific Helmets have recently introduced two new models into their already extensive range. New designs such as the A7A with a full integral face shield and the A10 with an integral eye protector (external face shield is optional) set new design



and safety standards. Both helmets are designed especially for the ambulance service and factor into consideration use in confined spaces, RTA's and also provide adequate protection in the event of a vehicle rollover or crash.

To be truly multi-purpose, the helmet needs to be lightweight, compact, provide all-over head protection and be useable with a stethoscope or ear defenders without removing the helmet during an incident. Obviously, there are many other desirable features such as comfort, retention on the head, multiple size adjustment with just one helmet, external graphics, safety reflective, brigade logos and simply looking fit for purpose to consider.

Increasingly paramedics are being involved in public order situations and dealing with injured people in the midst of terrorist threats. Full head coverage without restricting movement or adversely ambient hearing, and the compact Kevlar reinforced shells make these designs unique.

These new designs reflect the fact that as a leading safety helmet manufacturer, Pacific Helmets is acutely aware of end-user requirements. The West Midlands and North East Ambulance Service are two ambulance brigades that have recently trialled these new helmets and found the lightweight, compact design ideal for their operational requirements.

If you would like to view the full range of PacificHelmets then please go to www.pacifichelmets.com



PAB goes COMPOSITE

Croatian company PAB PERSONAL PROTECTIVE EQUIPMENT, a player in the industry since 1953, has newly engineered a leading edge, professional fire helmet of tomorrow. Together with its composite technology, unique innovative development, and highest level manufacturing standards, the company has reached a new milestone in protective equipment for professional use by fire fighters. The unprecedented helmet characteristics reveal the helmet's key advantages.

The helmet is a response to contemporary demand and challenges facing the professional field while using the latest developments in the composite material technology.

PAB has introduced an extremely light-weight protective helmet, weighing revolutionary 1.1kg, including visor face shield and neck protector. Moreover, the helmet has numerous upgrade options, offering full head protection in extreme temperature conditions. **PAB FIRE 04 HT COMPOSITE**, as opposed to standard helmets in the market, endures temperatures as high as 260°C for 15 minutes and a fire flashover of 1000°C for 10 seconds.

NEW TECHNOLOGY

Such high level of endurance is achieved through newly introduced and developed technology for manufacturing outer shell from composite materials. Further to its extreme temperature





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properties, such as helmet is lighter and more resistant to mechanical impacts than any standard helmet.

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The helmet includes a flip down face visor enabling full face protection against high temperatures, mechanical impacts or drizzling of liquids. Additional neck protection is possible by a removable aluminium carbon-fibre neck protector. Helmet is ready to use with a mask, either by exterior or interior fastening.

Within the shell is a shock absorber made of polyurethane foam. In addition to its regular features, such as amortisation, shock absorber adds a significant impact on insulation characteristics as well. The polyurethane foam padding is covered by a system of straps. The size of the helmet can be instantly adjusted by a spinning-click button, integrated into a basket of supporting stripes. Fastening the helmet is easy thanks to Nomex Chinstrap using quick release snap connection buckle. Due to its adorable design and extremely facile size adjustment system (ranging from 52-62cm), the helmet fits any professional head perfectly. Finally, its interior ventilating channels enable safe and comfortable work.

PAB FIRE 04 HT COMPOSITE is made in



conformity with new European standard EN 443/2008 and is currently in the process of being granted an adequate certificate. Its key features include:

- Lightweight, only 1100g
- Extreme temperature resistance (up to 1000°C)
- Latest European standards conformity (EN 443/2008)
- Full head protection, including neck and face.

The helmet is available in the following colours:

- red
- yellow-green
- white
- yellow
- photo luminescent yellow-green colours

Other colours may be delivered upon request.

Company PAB was established in 1953 and has over the decades grown into a high tech developer and manufacturer of protective helmets and body safety gear. With its commitment to consistent quality, continuous close relationship with the firefighting professionals, their remarkable talent in engineering, PAB Company has grown to be recognized as a leading edge manufacturer of a reliable body safety gear worldwide.

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Since the Firefighter 4000 became the first boot to attain the new BSEN 15090:2006 approval, the boots manufacturers CENTURY SAFETY, have enjoyed rapid expansion in global sales.

The Firefighter 4000 has been designed to offer users a much higher level of comfort than they might normally expect from a rubber boot. Cushioned insoles, orthopaedic lasts and a choice of width fittings plus a dedicated ladies model combine to eliminate the discomfort often associated with this type of footwear.

Commenting on the background to the companies export success Mark Trueman, Century's Divisional was quick to point out the importance of design. "There has been little progress in the design of rubber fire boots with many manufacturers relying on outdated materials, 50 year old patterns and bulky, loose fitting lasts. The Firefighter 4000 is entirely different, being designed entirely from scratch to enable to use of

the very latest boot building technology, modern materials and the correct fitting lasts resulting in a much better ergonomic experience for users. It's this comfort experience that has helped us convince fire services in 35 countries select Firefighter 4000 over the competition."

Century are working on further enhancements to the Firefighter range with leather and hazardous materials fire boots due for launch later in 2008.

The Firefighter 4000 is available in UK sizes 5 to 13 and the Ladies in sizes 3 to 8. It has a recommended price of £65.00.

For further information please contact:
Nicola Brunton
Century Safety by Hunter Boot Ltd.
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Our fire fighter boots are available in the sizes 38 - 48 and correspond to the actual European safety standards. The boots are made from waterproof leather and are equipped with an intermediary steel sole

($\geq$ 200 joule) and a toe protection cap. Further features of the pictured ULTRA are the fast-zip-system and the air-cushion-system. For further information about us and our products: www.hanrath-schuhe.de

More than 130 years manufacturing safety shoes to the highest standards

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Professionals need professional footwear



Today, modern footwear systems are able to offer more than only protection to the foot by means of a steel toe cap and a steel midsole. High-performance functional footwear should be adjusted to the wearer's tasks and the associated occupational hazards.

A balanced foot climate also plays a very important role. Especially anatomical points of view are not considered in a norm, but are very important to avoid long-term damages to the human body as far as it is technically possible.

Good functional professional footwear should therefore not only protect from incoming moisture but also have systems which absorb foot perspiration during the daily usage and transport the occurring foot perspiration outside by means of membrane and

conditioning system, as for example the **HAIX®-Climate-System**.

To reduce the daily pressure which affects the feet by body weight and equipment, the footwear should be designed in a way that the weight is absorbed during treading and the arising energy is converted into kinetic energy. The right outsole does play a special role here. It has to support reproducing the natural rolling movement of the human foot, work anti-skid and have features that ease the wearer's tasks. For this, foot and boot has to unite. The choice of the correct shoe size and the anatomical shape forming of the inner shoe have a particular importance.

If the inner side of the shoe corresponds to the anatomical form of the human heel as far as possible, foot and boot can unite. The shoe becomes then the flexible foundation of the human body. It protects him, eases his tasks and avoids, as far as possible, long-term health damages.

To guarantee all these characteristics during the whole lifespan of the boot, it is an important precondition to select quality materials. Here, the correct choice of leather and its processing is decisive. Only leathers that are worked to keep their shape for a long period of time, can base and support the foot. This of course effects the price. HAIX®, the German producer of functional footwear, does produce footwear with these required characteristics. The article Fire Hunter convinces among other products.

This firefighting boot meets even the hardest requirements. For optimal comfort, this boot is equipped with the **HAIX®-MSL-System**. By injecting PU foam it is attained that the boot is waterproof, that the foot is cushioned from heel to ball during going and standing, and that upper, insole and outsole are connected durably. This high-tech functional boot is equipped with **waterproof leather** and the **GORE-TEX® membrane**, the **HAIX®-Climate-System** and a **rubber toe cap**. It is antistatic according to **DIN EN 344/345**. With its rubber outsole having a marked tread, it is solid when standing, in the country, when standing on ladders, and it is extremely nonskid.

A **penetration proof insole** worked into the sole protects the wearer from hurtful impacts from below. The sole distinguishes by

a **marked heel front**, is **oil and fuel resistant** and **non-marking**. The basis for this perfect functional boot is as for all articles produced at HAIX® the knowledge of the usage, the operational area and the daily strain.

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For more information, please contact:

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Website: www.haix.com

Hanrath Schuh-GmbH

For more than 130 years the HANRATH SCHUH-GMBH – located in the west of Germany – has manufactured safety shoes to the highest standards.

For **fire fighters**, Hanrath Schuh-GmbH offers similar shoe models in different price ranges:

Top-of-the-line model is the **laced boot PROFI PLUS**. It is available for **only €99.00** (+ tax and dispatch). Shaft height is 30cm, the upper material is waterproof leather. Special feature is the **FIRETEX** Climate System which provides a waterproof barrier, yet breathes actively through the invisibly incorporated paper thin and feather light highly technical Climatic Membrane and provides maximum comfort.

The PROFI PLUS is equipped with an intermediary steel sole and the toe protection cap. Further features like the air-cushion-system, the ankle-twist-protection and the fast-zip-system will convince you of this boot.

The **laced boot ULTRA**, the entry-level fire fighter boot from Hanrath, is available at just **€59.95** (+ tax and dispatch).

This fire fighter boot, with its shaft of 24cm, comes with the fast-zip-system, the intermediary steel sole, the toe protection cap and the air-cushion-system



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and the upper material is the same as the PROFI PLUS model with waterproof leather.

Further laced boots from Hanrath are called **PROFI** and **SPARK**. These boots differ in the height of the shaft and the inner material, respectively the climate membrane. All types of fire fighter boots are available in the sizes 38-48 and correspond to the actual European safety standards.

Our highlight in 2008: From autumn 2008 we will offer our fire fighter boots with crop protection for a small additional charge.

Also in our product range, we offer the innovative, high-performance protection for all leather called **PROTECT Nano-Spray**. Smallest nano-particles build on to the material an invisible protective coating, which is oil, acid and fuel repellent. Special feature: **PROTECT** is also particularly

suitable for boots with climate membrane. 400 ml aerosol costs only €7.95 (+ tax and dispatch).

For more information, please contact:

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ESKA® one of the world's leading brands for high-quality, traditional glove making

In 1912, Josef Eska founded the family business in the small mountain town of Bärtingen, close to the resort of Karlsbad. Nowadays the company is based in the Austrian town of Wels, and is being successfully managed in its fourth generation.

In 1974 the company started to develop fire fighter gloves. Criteria such as ultimate safety and feel had and still have top priority – with which standards were set from the very beginning. Today ESKA, as probably the most innovative manufacturer in this sector, enjoys the highest recognition worldwide.

We would like to present two of our range of fire fighter gloves: the Jupiter II and the Super Mars III:

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- Special waterproof non-flammable, non-shrinking, oil and water repellent, acid resistant leather.
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New generation of all Kermal JUPITER gloves from ESKA!

Impregnated Kevlar outer palm from the fingertips to the cuff base, the glove is provided with waterproof, windproof and active-breathing GORE-TEX® membranes (PTFE), which is guaranteed to be permanently attached using the ESKA patented process.

JUPITER II provides protection against heat and flame and the glove also provides protection against cold, while being resistant to puncture and laceration, oil and is gas repellent.

A heat and shock absorber is intergrated into the knuckle are of the hand. The JUPITER II is 100% matched to the hand by virtue of its ergonomic 3 dimensional cut.

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- Ideal for people allergic to leather.
- Sizes XXS-XXXL.



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- Knuckle protection pad.
- Crosstech chemical protection membrane from the finger tips to the end of the cuff, 100% permanently attached by means of ESKA patented processing.
- Supermars 3 is waterproof with a blood borne pathogen protection barrier, active-breathing + optimum heat and cold protection.

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Our distributor for Australia and New Zealand is Pacific Helmets, a fire distribution company which is also the master distributor for ESKA fire, rescue and military gloves.

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Website: www.eska.com

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Reach out in confidence with FireMaster gloves

Currently used by over 80% of UK fire brigades, the FireMaster® range of gloves from SOUTHCOMBE BROTHERS are moving successfully into international markets.

The only gloves in the world made with Southcombe Brothers' unique PYROHIDE® fire-resistant leather, FireMaster Ultra® gloves are crafted with premium, high-end materials at every stage. Fully NFPA and EN659 certified, designed for supreme heat and cut-resistance but still dextrous and lightweight, US fire departments have been clamouring for test samples.

"Thanks for producing such a great product," said Lieutenant Mike Ray from Bellingham Fire Dept, Washington, USA. "Our firefighters have seen a great increase in their ability to perform their job while wearing your NFPA approved firefighting gloves. The Crosstech™ liner prevents contamination, and keeps our hands dry and warm. The cost of the gloves is slightly higher than other brands, but the cost savings due to the quality of construction and material used which allow them to last significantly longer than other brands makes up for it. Our department is finding that the gloves are lasting heavy use and multiple washings better than any other glove we have used. We are saving money, and we are able to provide a better firefighting force due to your gloves."

Designed and made in the UK, Southcombe Brothers used their impressive



blend of expertise, experience and market knowledge to develop the FireMaster® range of gloves. "We listened to what firefighters were saying," says Jason Dutfield, Key Accounts Manager. "One of our key strengths is being able to work directly with our users to develop gloves that are just right for them. That may mean changing the finger lengths, widths or other bespoke alterations that mean our gloves fit perfectly, first and every time."

The finger-curved design has been imitated but never bettered. The refined design gives confidence that only comes from excellent fitting, lightweight, leather gloves. And even when immersed in water,

the gloves come up dry and dextrous, easy to don and doff and dextrous enough to press the 'man-down' button.

Made from Pyrohide® fire-resistant grain leather, unique to Southcombe Brothers, the gloves will not crack or warp under extreme heat conditions. And this amazing leather is not just fire-resistant, it will repel chemicals, liquids and heat – then dries soft and supple. The gloves also use a Gore Crosstech™ membrane, Kevlar™ palm and finger patches, Kevlar™ blended linings, Kevlar™/Nomex™ cuffing (on wrist-let models only) and are stitched throughout with Nomex™ thread.

"There's a reason why we supply almost 80% of fire brigades in the UK," said David Southcombe, Managing Director of Southcombe Brothers Ltd. "And that is because our gloves consistently outperform all others. With 160 years in business behind us we have made it our mission simply to make the best performing fire gloves on the market. We have no interest in cutting corners or imitating inferior designs."

Visit Southcombe Brothers Ltd and learn more about their technical glove range at www.southcombe.com
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Figure 1. Fire test in a simulated office – flashover occurs and temperatures reach 1,100°C before eight minutes. © 2008 FM Global. Reprinted with permission. All rights reserved



Rising to the Challenge

By **Brendan MacGrath**

Manager, International Codes and Standards Group, FM Global

How automatic sprinklers protect against the threat of fire in high-rise buildings – and how to ensure they do so effectively and reliably

A fire in a single-storey office building is a lesser challenge than a storage warehouse. That's true in all likelihood, however, that does not mean that a fire in an office merely a matter of a "first-aid" based fire-fighting response. Take a look at Fig. 1: this is a fire test carried out in a mock-up of a typical office just eight minutes after light-off in a corner-located waste-paper basket. This "light hazard occupancy" has already experienced flashover and temperatures are around 1,100°C! In a real building – with its myriad of potential ignition sources – this fire can be expected to rapidly spread to adjacent combustibles such as furniture, wall coverings, paper, books, files, plastic and soon become a major incident for the responding fire and rescue services to tend with.

Now, stack-up the risks associated with this single floor event by 10, 50 or even more — enough to equal the number of stories in the "typical" and ever-taller modern high-rise building. Then, add to this the fact that many of the floors in these buildings are not housing offices alone, but also residential property and mercantile activities such as restaurants, department stores, and entertainment venues such as casinos. Many of these are often located at the uppermost building levels and with even greater combustible loadings. Consider also, per the high rise egress article in APF March 2008 edition, that such

"Mega-Resort" buildings can have be occupied by 70, 100 and even up to 250 thousand people! What were once properties that traditionally experienced peak occupancy levels during normal office hours have now become veritable towns and cities within themselves!

First of all, let's consider the response capabilities of public fire service in these properties. Fire appliance ladders have a very limited reach, in most cases a maximum of seven stories, meaning fires within high-rise buildings nearly always have to be fought from the inside. With each additional story, it becomes more difficult for fire-fighters to successfully combat a fire. Indeed, studies in Europe have shown that a fully-laden fire-fighter could take up to 30 minutes to reach a building's 30th floor using a stairwell. The problem can be further compounded by the delays experienced in reaching such buildings, often located in densely populated and congested urban areas with traffic gridlock – this was evident in the January 2007 fire in a 35 storey building under construction in Dubai, where reportedly, dense traffic delayed the fire service arrival by up to one hour. Then, once the evacuation of the occupants is assured and completed, the fire and rescue services set about the task of tackling the fire itself.

In a high rise building, it's not *just* all about limiting fire spread to within a single storey. Above all there's the exterior and interior floor-to-floor

Figure 2. Torre Windsor, Madrid – February 2005: fire spread up and downwards via multiple openings and breaches in wall and floor fire stops in this 30-storey office building



fire spread hazard to contend with. External fire spread occurs when windows are relatively large and spaced close together. An uncontrolled fire engulfing a large area of one floor typically will develop to a “flashover” state per Figure 1, breaking windows and permitting flames to travel up the outside of the building. The heat from the flames can break windows on the floors above or can radiate through unbroken windows and ignite interior combustibles nearby. Then, flames from both floors will fan upward like a torch, repeating the process. Meanwhile, internal fire spread can occur through open stairwells or escalators, openings in otherwise enclosed stairwells or elevator shafts, ductwork or utility openings in floor slabs. Another avenue of fire spread is behind the building’s exterior curtain walls through inadequately sealed spaces between floor slab and the interior face of the curtain wall. Now, add to this the fact that smoke can travel through openings provided to carry utility services from floor to floor, and that heating, ventilation and air conditioning ducts can circulate these products of combustion to large areas remote from the fire, all of which can further hamper the efforts of the fire services.

So, all told, these buildings contain all the potential ingredients and components of a major fire with potentially devastating consequences. And this is borne out by the fire loss history in such buildings.

A fire starting on the 21st floor in the unsprinklered 30 storey Torre Windsor building in

Madrid in February 2005, spread upward **and downward** fire via multiple wall and floor openings. Over the lifetime of the nearly thirty-year-old facility, the integrity of fire-stop materials protecting openings had gradually degraded due to modifications. What’s more, in this event, the upper levels supported on a steel frame collapsed due to their exposure to the uncontrolled fire temperatures (Figure 1 at 1,100°C) well in excess of the 540°C at which point structural steel rapidly loses strength. This scenario was further demonstrated in the very recent (13th May 2008) fire and partial collapse of a 14 storey university building in Delft, The Netherlands,

All of the above challenges, the inherent fire hazards, the safety of an ever larger number of occupants, the complexity of the multiple fire-fighting challenges, all of these further emphasise the importance of the most proven and cost-effective means of fighting fires in such buildings, automatic fire sprinklers. Building regulations and codes in many Asian countries recognise their need and importance e.g. in China, commercial high-rise properties over 24m in height require fire sprinklers.

Automatic sprinklers act promptly – often within less than a few minutes of ignition – to control a fire, limiting the room temperature (often to less than 60°C), and also can be very effective in minimising the amount of smoke generated. Compare the unsprinklered fire test in Figure 1 (and the resulting consequences in Figure 2) versus those of another real-life fire in an office building, this time fitted with sprinklers (Figure 3). Three sprinkler heads operated which successfully controlled and indeed extinguished the fire by the time the public fire brigade arrived, who had received notification thanks to the water flow alarm.

Loss Experience and Reliability

The loss experience of FM Global’s clients from 1997 to 2007 clearly illustrates the advantage of adequate sprinkler protection in high-rise building fires. As shown in Figure 4 below, where sprinkler protection was adequate, the average gross loss from a fire was US\$213,000. Where sprinkler protection was not provided or inadequate, the average loss cost jumped to US\$1,658,000. This represents an average reduction of some 87% in terms of the property loss consequences.

In addition to the cost of the damaged property, such major fires often result in many additional impacts, such as the safety of the occupants and of the fire and rescue services, the disruption and interruption to the staff’s livelihoods and of those supplying goods and services to such facilities, and the environmental cost (polluted water, air-borne contaminants, debris removal and the carbon footprint).

A subject of much study is the overall reliability

and effectiveness of sprinklers. The above figures show how effective adequate sprinkler protection is when provided. This begs the question, how often do sprinklers systems reliably and effectively control fires? FM Global data concludes that the reliability of the most common type of sprinkler installation, a wet-pipe system, ranges between 94 and 98%. When adjusted for an estimated number of successfully sprinkler-controlled fires, these figures increase to over 99%. This is line with the findings of other studies e.g. Marryatt, Australia (99%) and the Association of German Property Insurers' (97.9%).

Fire Experience in Sprinklered Facilities

The numbers above speak for themselves. Sprinklers are very effective and they are very reliable. Nevertheless, some major fire incidents in high-rise buildings in Asia and elsewhere have raised concerns. While not intending to address the specific issues in such events, the author would like to share FM Global's experience, a leading industrial and commercial property insurance company in this area. In particular, what the major factors that will help to ensure that a fire sprinkler system will always perform the job it's being relied upon to do. Should these be ignored, an owner or tenant could be putting their facility, its occupants and those called to respond to an emergency, at significant risk.

Keep the Sprinkler Valves Open

Defeat of a sprinkler system due to a shut valve remains one the leading and yet very avoidable problems. It is critically important that all valves between the water supply and the sprinkler heads be in the open position and ready to operate at all times. And this means both **before** and **during** a fire emergency. It also means **'after'** too – every effort should be made to get the sprinkler system back in service as soon as possible following a fire.

FM Global offers the following advice (ref: FM Global Data Sheet No. 2-81 Fire Protection System Inspection, Testing and Maintenance – which is available free at www.fmglobaldatasheets.com).

'Before': Firstly, secure all valves between the water supply and the sprinklers in their fully open position with a lock and chain or other similar sturdy means. Secondly, tag, list and inspect the valves weekly to ensure they remain open. Thirdly, thoroughly manage closure impairments to sprinkler systems. These three basic measures are the probably the most important basic steps needed to ensure the fire protection system is going to work when needed.

'During': This means steps must be taken to ensure all valves, and above all the sprinkler riser valve concerned, remain open **for as long as they need to be** during and until the very end of the fire emergency. Unfortunately, and still too many times, an ill-informed decision to shut-off the sprinkler system before the fire's been fully controlled has lead to disaster. By the time the mistake has been realised, and the decision's been taken to reopen the valve, it's usually too late. Without sprinkler water, a fire can re-establish, continue to spread, thereby opening a large and excessive number of sprinklers in its path, potentially rendering the system ineffective.

A sprinkler riser valve should only be closed once the responding fire professionals have



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Figure 3. Photo taken **after** a fire in an office building **fitted with sprinklers**. Normal operations recommenced the following day.
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precisely located the seat of the fire and not until the final extinguishment operations have been adequately prepared, initiated and essentially completed. Overall, to ensure a sprinkler riser valve remains open during the fire emergency, FM Global experience demonstrates that pre-assigning a person to physically remain at the sprinkler riser valve for the entire duration of the fire emergency (as long as it is safe to do so) is the most effective way to prevent the defeat of the sprinkler system due to early-closure during a fire emergency. This way, one ensures that the investment does what it's been designed to do: provide 24/7 protection for assets and occupants.

Keep the Sprinkler Water Supply On

High rise buildings invariably require the use of pumps to provide water at adequate pressure and flow. FM Global, in its new Data Sheet 3-7 (available on the above mentioned website from mid-June 2008) provides the following main design considerations – in addition to others – for high rise buildings which help to ensure the fire pump remains on and effective during a fire emergency:

- Locate all fire pumps on the first floor or a basement level of the building and consider flood exposure.
- Do not use an in-series fire pump design as this creates unacceptable reliability concerns. For

example, consider a three-zoned building fed with staged pumps. This means that water **only** reaches the third zone when all three pumps start-up. With approximately a 3% failure-to-start rate for electric-motor-driven units, the reliability for the third zone is therefore reduced from 97% to 91% i.e. almost one in eleven times, there is no water available in the third zone.

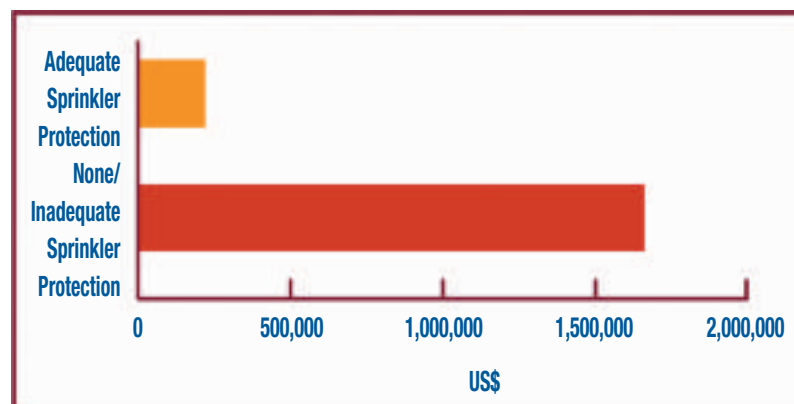
- Systems should be designed in order to avoid the need for pressure-reducing valves. If unavoidable, they should be installed (per FM Global Data Sheet 3-11) with the drain piping etc. needed to allow maintenance and full-flow testing. Otherwise, and as loss and testing experience shows, such valves can mal-function thereby preventing enough water from reaching the fire. The cost of this maintenance during the facility's lifetime should be factored in to the choice of the water supply design.

Needless to say, fire pumps should be **tested regularly** in order to ensure they're going to reliably do their job. The FM Global Data Sheet No. 2-81 provides additional specific information on how to perform and document such tests. A weekly frequency is recommended.

Water Supply Duration

A subject of frequent discussion is the water supply duration needed to protect a high rise building (FM Global recommends a 60 minute minimum duration). It is true that many fires in offices with low-ceilings located in high-rise buildings are indeed controlled and sometimes even extinguished by a small number of sprinkler heads and, the professional fire-fighters reaches the fire area in say less than 15 to 20 minutes. However, for

Figure 4. The effectiveness of fire sprinklers in high-rise buildings: property and business interruption loss data (1997-2007) for fires with adequate sprinkler protection versus those where none provided or was inadequate.
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the same reasons that safety factors are included in the designs of bridges and buildings, so too is it appropriate that the sprinkler system water supply should also be sized for eventualities beyond a 'typical' fire event. Scenarios such as electrical-fault ignition causing fires on multiple floors, fire in a concealed space breaking-out in another area or floor, and a fire set in multiple areas by an arsonist and delays to the responding public fire brigade will all result in an increased water demand. Due to the building being closed during a holiday period, the fire services took 45 minutes to access the fire floor in the example shown in Figure 3.

The supply should also be robust enough to deal with a scenario where a fire re-kindles or, as experience shows, where an arsonist whose first efforts have been "frustrated" by a sprinkler system, is prone to strike again when the water tank may not have had time to fully refill.

Sprinklers Missing or Not Suited to Occupancy Hazard

Building regulations or a fire safety engineering risk assessment might conclude that sprinklers are not required in a certain area due to the lack of combustible construction or materials. However, the conditions on the day a building's occupancy licence is obtained may not be the case a year down the line and less so during the entire life of the facility. Spaces are inevitably filled, e.g. by temporary storage, seasonal displays and decorations, or even new expanded operations. In such cases, sprinkler protection must now be extended

to cover these new fire hazards which were not present in the original design.

One design doesn't fit all: while sprinkler systems have and continue to provide highly resilient and cost-effective protection for property and occupants, it's important to remember that the sprinkler system design needed to control an office fire is not the same as for a mercantile area, and it is far less likely to control a fire in a storage area such as paper archives, or maintenance supplies and parts. Furthermore, fire sprinkler heads themselves exist in many different varieties and it is essential to select the type which is matched to the fire hazard it's protecting. Sprinklers should also be manufactured, tested and certified to a recognised and proven standard.

Conclusion

Fire sprinklers are proven as the most cost-effective means of protecting high rise properties and their ever-increasing number of occupants. And, just like all fire protection systems, they need regular supervision and maintenance if they are to provide the highest levels of performance and reliability that are needed in these properties, wherever and whenever a fire emergency occurs. Keeping the valves open and the water supply on are critical.

FM Global is a commercial and industrial property insurance company. If you have comments or questions on this article, please contact the author, Brendan MacGrath, Manager, International Codes and Standards Group at email: brendan.macgrath@fmglobal.com

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Aircraft Recovery Readiness

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Aircraft Recovery (AR) is an unfortunate event than can occur on any airport. Recent events such as the bogged-down B-737 in Bukarest, the A-340 over-run in Quinto, the nose gear collapse of an USAF C-17, and the B-777 at London Heathrow accident are just a few of the many disabled aircraft incidents that have occurred within the past few months.

By John A. Olsen

Senior Program
Manager, Fraport AG
Fire Training Center

The continually increase in air traffic, and the evolution of new large aircraft present significant challenges to safely an effectively deal with a disabled aircraft recovery event. Aircraft recovery is not a simple task and in many cases can be a very challenging and costly for the airport operator and the aircraft carrier. This article looks into the basic aspects of aircraft recovery, addresses the complexities of a recovery incident and emphasizes why airports and aircraft carriers need to better prepared to handle the unfortunate event of a disabled aircraft.

The underestimated risk

Official statistics on the actual number and types of disabled aircraft recovery incidents is not available, research has shown that on an average, each week an aircraft incident needing recovery occurs.

A disabled aircraft, whether a simple or major incident create many challenges for the aircraft carrier and airport operator. When an aircraft becomes disabled on or within the vicinity of the active runway or in any portion of the aircraft

movement areas, airport operations, in many cases, virtually come to a halt.

Regardless of the complexity of the recovery scenario, direct revenue loss to the airport can run quickly into the millions, making the safe and timely removal of the disabled aircraft essential.

Unfortunately, preparation for the safe removal of a disabled aircraft recovery is often not one of airport operators major priorities. Our experience has shown that 9 out of 10 airports and aircraft carriers have not adequately prepared to handle even the simplest recovery event.

In addition, the complexities of the New Large Aircrafts (NLA) like the A380 and B747-800, B777 or the future 787 Dreamliner, will require significant changes in standard aircraft recovery procedures in terms of complexity and needed tooling. The increased weight, height of the wings, low allowable skin pressures and the design in modern wings make new tooling and procedures necessary.

To cope with a potential AR incident and to reduce the loss of revenue airports and aircraft carriers alike need to be prepared and equipped



to safely and expeditiously react to a recovery incident.

As you read on, consider the following:

Timely removal of an aircraft is the responsibility of the carrier, but what is timely when a runway is closed?

Do equipment pools that many carriers currently rely on allow have all the necessary tooling required for your specific recovery event?

Can a carrier or airport get the correct adequate equipment in place?

If a runway is closed, can equipment even fly into your airport?

Can the aircraft carrier deploy the needed tooling and recovery specialist without delay?

Can my current equipment deal with the new requirements of NLA?

Does the airport have recovery equipment,



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What is AR?

Aircraft Recovery is the safe and timely removal of a disabled AC that cannot move under its own power or through the normal use of an appropriate tow tractor and tow bar.

There are two key words in this definition . . . *Safe and Timely.* The recovery of a disabled aircraft commonly presents challenges of having the right tooling and training to safely recover the aircraft without causing secondary damage. Depending upon the situation, the safe recovery of a disabled aircraft can in many cases be a timely process. A aircraft is heavy and can damage easily.

Naturally, the priority of the airport operator will be to place priority emphasis on removing the disabled aircraft and getting the airport back to normal operations. For the carrier and insurance company preventing secondary damage is the key objective.

The recovery case can be a "simple" debogging of a landing gear or involve the extensive employment of specialized recovery equipment to construct temporary roads, lift the aircraft and transport the aircraft to a safe location for repair.

Equipment like lifting bags systems, multi-slings, temporary road mats, tethering devices and debogging slings are the basic equipment necessary for a team to operate during a recovery operation. However, the recovery challenges of NLA has forced to take a closer look at current procedures and tooling requirements. Recently new equipment has been developed to cope with the demands of NLA, like the Rapid Recovery Solution (R2S) of RESQTEC. A system that can be easily deployed to lift NLA quickly, with more control and stability then most standard recovery bags and jacks.

How is responsible

Airport Services Manual (ASM) Part 5 places the responsibility for the timely removal of a disabled aircraft on the aircraft carrier and further recommends that the airport have an established plan to deal with recovery events. In the case of an aircraft recovery, it's not a matter of responsibility, it's a matter of shared interest. When we analyze the effects of an aircraft incident, we can surely agree that it is in the best interest of both the airport operator and air carrier to execute a timely and safe aircraft recovery operation.

Business Case

Depending on the resources available and the situation, it can take as little as 4 to 8 hours to get a aircraft away from its stranded position . . . however a complete recovery could also take weeks. Inquired costs to a average airport easily run into cost in excess of 2000 Euro a minute (exact cost are hard to state, as it depends on location, airport etc among others). Determining tooling requirements, consideration should be given to the ease of operation and equipment deployment, set-up and operation time.

The question always is how well to prepare and how much money should be invested into establishing an aircraft recovery capability. Ideally one should consider sufficient investment to deal with every scenario, but that can be costly and difficult to achieve. If we put things into perspective,



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airports generally invest significant amounts of money into airport fire and safety programs which is a must. Like wise, equivalent priority should be given to adequately preparing for the recovery of a disabled aircraft. In general a Airport can adequately prepare for most common scenario's with approx 2-3 million Euro's.

Guidelines

There are some documents that describe how recovery operations should be preformed.

Aircraft Manufacturers publish Aircraft Recovery Manuals (ARM) which provides detailed technical and procedural information necessary to recover a specific type of aircraft. They are the most important document for a recovery operation and should be followed.

The International Civil Aviation Organization (ICAO) has recently published a revised version of ASM Part 5. This document provides valuable information and guidelines to assist airports in preparing for disabled aircraft recovery incidents. It is sometimes mistaken that the document is a obligatory document, this is not the case. The document is meant to provide recommendations, guidance and insight into how an airport can prepare for recovery operations. The revised version provides additional guidance on recovery procedures for NLA.

IATA Aircraft Recovery Taskforce (ARF) is the most important platform in the aircraft recovery profession. The ARF is a group of experts from carriers, aircraft manufacturers, aircraft recovery specialist, Airports and tooling manufacturers. The objective of the IATA ARF is improve aircraft recovery procedures and to create a networking platform to share recovery incident experiences and to foster the development of new aircraft recovery technologies.

Disabled Aircraft Recovery Preparedness

When an aircraft slides off the end of the runway, gets bogged down and causes the closure of the runway . . . is not the time to start thinking about aircraft recovery preparedness. Have a plan upfront when that unfortunate day arrives that you are confronted with the demanding challenge

of removing a disabled aircraft from your runway is critical! Professional aircraft recovery preparedness is a must for efficient airport operations.

The purpose of the disable aircraft recovery plan is to make suitable arrangements (in advance) to ensure the prompt availability of the appropriate recovery equipment and any experts who may be required.

The best way to prepare for aircraft recovery is to establish a planning team, define your risk potential and raise the awareness at upper level management. Present a business case that is based on "facts" that shows the economical advantages of being adequately prepared, equipped and trained for recovery events. In many cases an airport or airline can obtain an immediate return on their aircraft recovery investment if they are capable of rapidly and safely removing the aircraft from the runway. Remember, a closed runway even for a short period of time can results in the loss of millions.

When purchasing developing procedures, please understand that there are no regulations or standardized procedures that govern equipment requirements or the level and intensity of the training required of personnel performing recovery operations. The ICAO manual Part 5 does not validate or propose any equipment, neither does any other organization like IATA or IATP. IATP is a equipment pools but do not certify or validate. The ARM's of the manufacturers are the best guideline, but may not reflex the latest developments in tooling or procedure if it is a older type aircraft.

Organizations like the Fire Training Center (FTC) of the Fraport AG or RESQTEC help clients with their disabled aircraft recovery planning efforts and assist in business case development. They can asses your organization and present a plan that involves recommendations for equipment, training and recovery procedures based on their clients risk potential. *After budget and a plan is available, choice of equipment can be made. Keep in mind the technological developments that can make your recovery operation easier.*

To learn more about Aircraft Recovery, a Information Workshop is organized each year. Last one was this April. Although by invitation only, for more information please contact RESQTEC. **APF**



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For your safety



Tunnel Vision for Video Smoke Detection

By Ian Moore

Managing Director of
D-Tec

Ian Moore, Managing Director of D-Tec – part of AD Group – considers the key issues surrounding tunnel fire safety – specifically with regard to the growing application of CCTV technology in road, rail and service tunnels where a rapid response to potential incidents is so critical – and highlights the positive experience on the ground of those who have adopted advanced Video Smoke Detection (VSD).

Challenging Environment

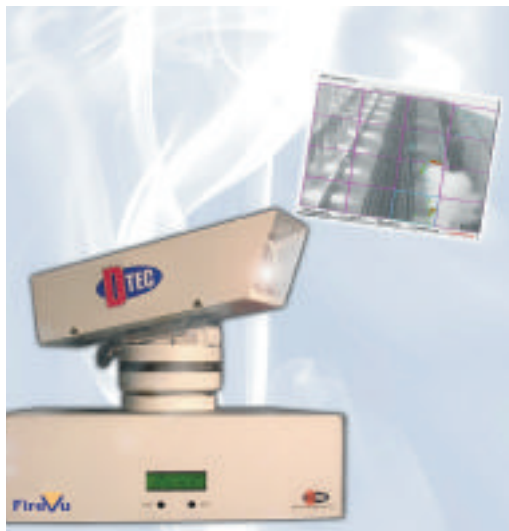
There is little doubt that the confined nature of a tunnel – by virtue of a small cross sectional area – presents a uniquely challenging environment where fire safety is concerned. Factors such as the length of tunnels, with some now stretching more than 50km, the difficulty of access, and the higher heat release rate from fire, make any delay even more critical when it comes to the potential for a blaze to be tackled and, crucially, those inside to be evacuated.

Against the backdrop of a number of major fire related incidents over the past decade, including the Mont Blanc Tunnel in 1999 which sadly claimed the lives of 39 people, a funicular railway tunnel fire in Kaprun, Austria, two years later where 155 died, and in March this year a fatal fire in the Melbourne City Link Tunnel, there has been

increasing interest in the application of CCTV cameras in conjunction with video analytics technology, specifically video smoke detection, to provide vital early warning of incidents.

As time is always critical with all fire detection systems, it is clear that smoke detection is needed and not heat detection to attain this advanced notice of impending danger. Sadly the reality is that in the past many people have perished by the time a heat detection system has initiated due to smoke inhalation and – in road tunnels – the accidents caused through a lack of vision for drivers.

Smoke detection in road tunnels was a previously unsolvable scenario due to the dirty environment that not only would have created many false alarms – as a result of vehicle exhaust fumes – but there was also the near impossible task of maintaining any devices to be operational



within their limits. VSD due to its design and complex algorithms can overcome these problems.

Anatomy of VSD

Looking in more detail at VSD this approach, initially developed for the nuclear industry, works by utilizing standard CCTV images in real-time – from up to eight cameras simultaneously – that are then analysed by specialized image processing software. This seeks out the particular pattern that smoke produces by applying extensive detection and known false alarm algorithms.

By programming the software to look for anticipated motion patterns of smoke over a specified area within a camera image, and analysing pixel changes, VSD has the potential to deliver an exceptionally fast response – typically in seconds. Crucially, once smoke has been detected the system can alert the operator as well as delivering a visual representation of the smoke on the system's monitor.

This ability to effectively detect smoke at source, unlike more traditional methods, means that VSD does not have to rely on the proximity of smoke to a detector and is therefore unaffected by distance. Whether the camera is situated 10 metres or 100 metres from a risk area, VSD has the capacity to detect smoke in the same amount of time, providing an early warning that would be impossible with conventional detection.

In addition, as the location of smoke can be readily identified by using cameras at multiple points, the VSD system can supply valuable management information, allowing passengers or commuters to be directed safely away from any incident whilst avoiding the most dangerous areas – this situational awareness is particularly beneficial in tunnels with a gradient where smoke as it rises will tend to gather more on a particular side of a fire.

It is important to stress that VSD is distinct from other camera-based detection systems which are in reality motion detectors or obscuration-change detectors that are unable to differentiate between smoke and other sources of

movement and are so liable to generate a high level of false alarms. This is not the case with VSD whose sophisticated algorithms allow it, for example, to readily distinguish between smoke and steam which can prove problematic for other solutions.

Early Warning for Sydney

When it comes to the practical application of CCTV camera-based Video Smoke Detection (VSD), with regards to tunnels, the AU\$554 million Sydney Harbour Road Tunnel – the largest privately-funded public works project in Australia – offers an impressive reference point in terms of the capability of this FM-approved technology to provide a rapid response to potential fires.

In this case, working closely with D-Tec's Australian agent, Chubb Fire Safety, VSD was retrofitted to 80 of the tunnel's CCTV cameras – 40 in each tube – offering a vital early warning of incidents in the tunnel which carries nearly 90,000 vehicles a day.

When the Sydney Harbour Tunnel was constructed, back in 1992, it was fitted with the best fire protection systems available at that time.

These measures consisted of thermal point detectors spaced every 15 metres over each lane; more than 40 CCTV cameras – an additional 48 cameras were installed in 2000 – facing oncoming traffic throughout both tubes; complimented by a manual deluge system operated from a dedicated 24-hour manned control room in North Sydney.

The catalyst for the move to implement a new D-Tec Video Smoke Detection solution came from an ongoing programme of intensive training and monthly maintenance by the Sydney Harbour Tunnel Company (SHTC).

With advances in technology, the tunnel's management was keen to look for more effective



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systems of fire detection. In conjunction with the Sydney Fire Brigade a series of controlled vehicle fires were created to test the tunnel's exhaust system's ability to remove smoke, the activation of the point detectors, and the capability of the deluge system to suppress a fire. At this stage the SHT management invited us (D-Tec) and our Australian agent Chubb Fire Safety to take part in these tests and trial the state-of-the-art Video Smoke Detection system (VSD).

Testing Times

During the live burning of the vehicles, temperatures at the fire site reached in excess of 500°C. All cameras in the fire's direct field of view were totally obscured within 25 seconds. The operation of the deluge system was delayed in order to allow the fire to develop and for a large volume of smoke to spread along the tunnel. Activation of any of the tunnel's alarms was monitored. After approximately five minutes, and a full blown fire with extreme temperatures, the deluge was operated and the fire contained.

The live images of the fire were screened through the VSD system and the first alarm was generated in 14 seconds of visible smoke and prior to any visible flames, a further 30 alarms were generated during the remainder of the test burn.

This was in stark contrast with the existing solution. At no point during the tests did any of the older automated systems within the tunnel generate an alarm.

As a result of the successful tests, the VSD was then procured by the Sydney Harbour Tunnel Company (SHTC) to cover 80 of the tunnel's existing CCTV cameras. The solution is capable of providing real time images and has a storage capacity of up to 5000 watermarked bitmap images. For the Sydney Harbour Tunnel the VSD hardware transmits its alarm signals to a dedicated NFP2 Chubb fire panel. The NFP2 then provides a visual and audible alarm within the tunnel control room and generates an interactive mimic panel via a graphic interface package known as "Digifire".

The system was commissioned with the full co-operation of the SHT control room staff and management and handed over in May 2006. Since that time thankfully the tunnel has been free from real time incidents. The fatal fire within the Melbourne City Link Tunnel in March 2007 reminds us that we must remain vigilant at all times.

Making the Right Connection

Looking ahead for future tunnel projects, whether it be protecting road tunnels in Italy or service tunnels in Dubai, from our perspective we see the



trend in VSD moving towards systems which come with a networked capability so any solution is not limited to being monitored locally on site.

Now with the latest IP enabled systems, such as our own FireVu, there is the potential to offer 24-hour remote monitoring and fast response to incidents, with alarm and associated video image distributed to an unlimited number of locations for review by using a network's TCP/IP (Transmission Control Protocol/Internet Protocol) as the communications backbone.

A key advantage, from a tunnel operator's perspective, is that one control centre can potentially be used to monitor a number of FireVu VSD tunnel installations. Crucially there is virtually no limitation on the distribution of alarm information as FireVu can be monitored on any PC. System faults are also reported via IP, and alarm information can be sent by SMS (Short Message Service) and MMS (Multi Media Service) to mobile telephones, hand-helds and via email.

As FireVu uses TCP/IP as the communications backbone it also allows easier and faster monitoring and diagnosis of installations, and hence the quicker resolution of any maintenance issues.

**Ultimately, we are likely to see many more
examples of CCTV being applied intelligently to
deliver fire safety benefits in areas such as tunnel
safety where there are critical gaps in the capability
of existing, conventional, alternatives.**

In addition, as all alarm events are recorded on the system's Digital Video Recorder (DVR) these can be readily accessed for pre and post-event analysis, allowing the operator to view what, or who, caused the incident. This ability can help to identify any changes that need to be made to a tunnel's Fire Safety plan.

Reconfiguring the FireVu system – when alterations have been made to the facility being protected – can be also carried out remotely, removing the cost and delay associated with travelling to the site.

A Wider View

Significantly, FireVu – which shares a common NetVu Connected technology base with other AD Group systems and its NetVu ObserVer GUI (Graphic User Interface) – has the potential to be integrated with a broad range of facilities management measures and security systems. This opens up the prospect of the same interface to be used to call up images associated with a fire incident and a criminal attack.

Ultimately, we are likely to see many more examples of CCTV being applied intelligently to deliver fire safety benefits in areas such as tunnel safety where there are critical gaps in the capability of existing, conventional, alternatives. This is underlined by the fact that when time is of the essence it is smoke and not heat detection that has the real potential to save lives.

Further details on D-Tec, VSD and FireVu can be found at www.dtec-fire.com. Copies of the company's sales literature are available on tel: +44(0) 870 458 1517, by fax on: +44(0) 870 458 1518 or via email: sales@dtec-fire.com

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Storage Tank Fire Protection

– preparing for the worst

By Peter Kristenson

EMEA Product Manager,
foam products,
Tyco Fire Suppression &
Building Products

While oil and petrochemical storage tank fires are rare, the fire at the Buncefield fuel depot in England in 2005 is a stark reminder of the imperative need to provide them with truly robust firefighting solutions. So argues Peter Kristenson, EMEA Product Manager for foam products with Tyco Fire Suppression & Building Products.

The statistics of the Buncefield fire make chilling reading; the fire engulfed more than 20 large fuel storage tanks and over 250,000 litres of foam concentrate and 25 million litres of water were needed to put out the blaze. It was the largest peacetime fire in Europe since the end of the Second World War and certainly at the top of the “major incident” scale of storage tank fires that occur, on average, once a month somewhere around the world, according to figures from Sveriges Provnings och Forskningsinstitut – the Swedish National Testing and Research Institute.

The Buncefield fire destroyed five percent of the UK’s petrol stocks, resulted in the evacuation of some 2,000 homes, and is believed to have cost the site’s operator and the British nation well in excess of £1 billion. Just eight months earlier, a massive explosion at BP’s Texas City refinery in the USA killed 15 people and injured 170 others.

So, even though petrochemical production, processing and storage facilities are constructed with meticulous care, and with painstaking attention to fire safety, tank farm fires do occur. When they do, firefighting protocols and equipment are tested to the limit.

Hardly surprising then that the industry’s attention is well and truly focused on the need to employ the most effective fire safety measures. Incidents like Buncefield highlighted the necessity to embrace a more strategic approach to foam stocks and the need to forge closer working relationships between the petrochemicals industry and those companies best positioned to offer expert advice and deliver integrated agent and delivery solutions.

In reality, there are just two possible responses to a storage tank fire, the first being to let it self-extinguish by leaving the fire to burn out. Clearly



not an acceptable solution from any standpoint – environmental, economic or political – as it would result in a massive fire that would burn for weeks, possibly months, and end only with the complete loss of the stored product. This response also calls for a major cooling operation to stop the fire from spreading to adjacent tanks and nearby structures. The second option, and far more effective and acceptable, is to actively extinguish the fire. This can be achieved only by using firefighting foams.

Fixed foam protection

Effective fixed foam systems are undeniably the best method of protection for storage tanks, as they do not demand the hasty assembly of emergency equipment and manpower. However, the type of system selected depends mainly on two factors, the tank structure and the nature of its contents.

It was almost 60 years ago that the first reliable storage tank fire protection solution was developed by SKUM™. Since then, SKUM brand systems have been developed for cone roof and fixed roof tanks, open-top floating roof tanks, covered floating roof tanks, and horizontal tanks. However, an explosion – such as occurred at Buncefield – may well result in significant damage to the tank structure, seriously reducing the effectiveness of foam generators used in fixed or “over-the-top” systems. So, while such systems have a well-earned reputation for cost effectiveness and reliability, this risk has led to the more widespread use of the less vulnerable sub-surface injection systems for applications where there is sufficient water pressure available for their use.

In sub-surface systems, foam is introduced close to the bottom of a tank through a separate foam line. The foam then floats to the surface to spread and extinguish the fire. However,

extreme care needs to be taken to ensure that this technique is not used on gasoline blends that contain alcohol or other polar solvent additives as oxygenates, as polar solvents destroy the foam, even where alcohol-resistant concentrates are used. Sub-surface injection also cannot be used on cone roof tanks with internal floaters, in accordance with NFPA (National Fire Protection Association) 11 – Standard for Low, Medium and High-expansion Foams.

The semi-subsurface injection technique overcomes this problem. It can be used for all types of fuel and has all of the benefits of

sub-surface injection. This technique uses a flexible hose that is filled with foam under pressure. When the system is activated, the hose floats from the bottom of the tank to deliver the foam to the surface. This technique is cited by the NFPA as being successfully installed in more than 60 countries around the world.

Fixed monitors & generators

Fixed monitors have shown to be a cost effective method for protecting relatively small storage tanks and associated spill or ground fires. Increasingly, remotely-operated monitors with electrical or hydraulic control systems and exceptional throw performance are enabling firefighters to remain at a safe distance from the fire. So much so that monitors have been used successfully to extinguish fires in larger diameter tanks, using high-flow devices and large diameter fire hoses. Today, delivery capabilities span from 1,000 litres-a-minute up to more than 20,000 litres-a-minute. However, in accordance with NFPA 11, monitors should not be deployed as primary protection for cone roof tanks with diameters in excess of 18 metres.

Following an explosion, horizontal tanks have been known to rupture, so it is essential to ensure that the bund area is sufficiently protected. Even





for larger bund areas in major tank farms, fixed low or medium-expansion generators can be used to create an effective foam blanket, with any residual fuel in the tank being protected using a monitor. In fact, monitors can be used to protect the bund area, but this results in much higher foam consumption, and the recommendation is for at least two monitors to protect larger bunds to ensure complete coverage and the effectiveness of the equipment in all wind conditions.

Fixed systems are also now more frequently used for floating roof tanks than was once the case. SKUM has developed specialised equipment for these applications, where foam pourers are used to protect the rim seal area, with the foam being contained by a foam dam. Nevertheless, good foam fluidity is essential to ensure that coverage is achieved rapidly. Some oil companies have installed both foam pourers and sub-surface systems to protect covered floating roof tanks.

Mobile trailer-mounted monitors come into their own as back-up for fixed foam systems, protecting the tank itself or the bund surrounding it, although with the advent of increasingly larger floating roof tanks, large-capacity monitor trailers are now also being adopted as primary firefighting solutions.

Suppressing vapour emissions

Foam is the ideal medium for the suppression of vapour from flammable liquids, toxic chemicals and LNG (Liquefied Natural Gas). For many years, it has been used with considerable success to cover un-ignited spills to ensure that ignition does

not occur and provide a vapour barrier to prevent re-ignition. The best foams are fluoroprotein-based foams or multi-purpose foams, which must always be used if covering water-soluble fuels. These multi-purpose foams are, if used at medium-expansion rates, particularly effective because they engulf the spill in a deep layer of stable foam bubbles that is not easily affected by wind on exposed sites.

Toxic chemicals – chlorine, ammonia and the like – are also stored in bulk and are a significant hazard if spilled, even into a containment area. Toxic vapour clouds can spread to represent a major contamination risk and, depending on the product's reactivity, either conventional firefighting foams or specialist concentrates can be applied. Here too, medium-expansion foam is the most effective solution with a layer of at least 0.5 metres being applied within three to four minutes. The American Gas Association, British Gas and Gaz de France have conducted extensive trials to evaluate the suitability of high-expansion foam as a vapour suppressant on LNG spills. These have also shown that high-expansion foam can contribute significantly to the control of LNG spill fires.

Of course, the practice should be to contain spills, wherever possible, within drainage systems to prevent their spreading. However, fighting fires in these drainage systems using portable equipment may well jeopardise the lives of fire fighters, as the draining systems can be so complex. In such cases, fixed monitors are often installed that incorporate supplementary hose lines to extinguish any small remaining pockets of fire.

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Fire Fighting – the latest technology for vehicle mounted pumps

By David Burton

Hale Products Europe

Fire pump designers are constantly using all the advances in mechanical and electrical engineering to maintain their designs at state of the art level and provide the most efficient and reliable products for the frontline fire fighter. There are a number of different vehicle mounted pump designs available to firefighters worldwide and one of the key distinctions is how many stages are required to generate the different pressure outputs required.

Since the mid 1960s in the UK, the availability of high flow/low pressure simultaneously with low flow/high pressure has been accepted as standard, and how that combination of flows/pressures has been achieved is due to the success of innovative new pump designs.

One of the first manufacturers to introduce a low and high pressure stages on a single shaft was Godiva Fire Pumps (later Hale Products Europe)

with the Universal Multi-pressure pump (UMP), the innovation of placing two impellers on a single shaft meant greater efficiency and performance. Combined with the use of light alloy the UMP and successive Godiva pumps became standard equipment for the UK fire service and many overseas brigades from the 1960s onwards.

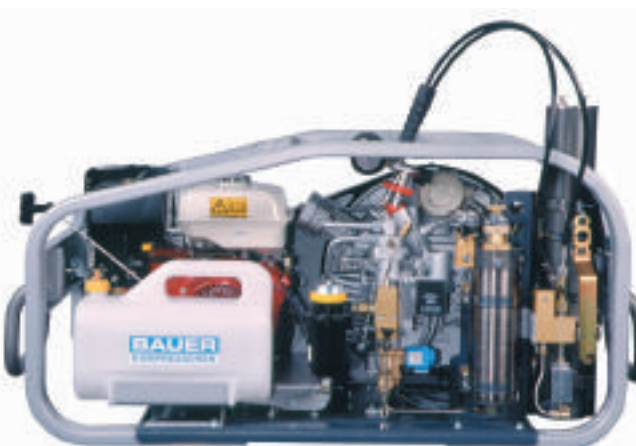
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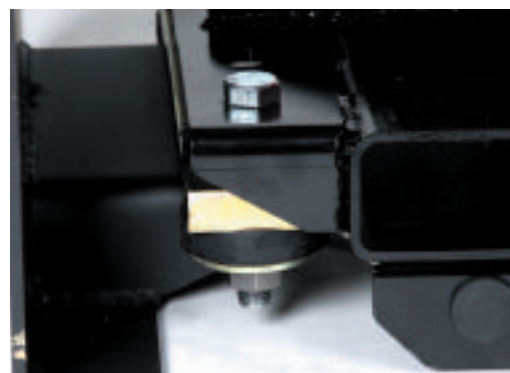
portability and compactness are critical. Portable pumps have also benefitted from utilizing the latest in two cylinder, air cooled engines to provide an impressive power source from minimum weight and size.

In a global market many pump manufacturers will ensure their products comply with the most respected engineering standards – in Europe it is with the EN rating system, this provides a performance rating based on the discharge flow and pressure, i.e. 2000 litres/min at 10 bar, 3000 litres/min at 10 bar, 4000 litres/min at 10 bar and 6000 litres/min at 10 bar. The acceptance of this standard is a valuable benchmark for assessing pump capability. For the North American market the equally demanding NFPA standards are important for a pump to meet and exceed in terms of performance and quality.

Issues relating to the pump installation envelope are also becoming more critical. If a vehicle mounted pump can be more compact, without compromising performance, the vehicle builder has more room to accommodate other life saving equipment, e.g. extrication tools, ventilation fans and thermal imaging cameras.

Combined with the drive for vehicle pump compactness is the need to make pumps easier for vehicle builders to install and pump maintenance technicians access. The addition of an integral mounting platform provides a number of beneficial features – the platform will be designed to suit the most common vehicle chassis structure, allowing the whole pump to be quickly and easily secured. The platform will also incorporate drainage taps at the front which are linked to the bearing housing for oil replacement and pump volute for water draining, both key maintenance activities. The mounting platform is also fitted with anti-vibration mounts which help reduce noise during use, another vital advantage during fire fighting operations. Another new installation feature of the latest vehicle mounted pumps is to make the suction connection project from the pump body at a shallow angle or even completely horizontal, thus avoiding any clashes with the vehicle pump bay floor structure. Also in the area of water supply issues is the inclusion of an optional integral collecting head for hydrant feed operations. Multiple tank to pump feed points also make pump installation more flexible. All these features make the pump more compact to install for the vehicle builder and easier to use for the fire fighter in the field.

Pump priming is also an area designers have improved in recent years. The latest reciprocating piston primer systems require less space in the



overall design, and by using an electromagnetic clutch are more efficient and reliable – there are less moving parts to wear, less noise and less fuel consumption and emissions. The modern piston primer uses less water (therefore is exposed to fewer abrasives), primes at a lower idle speed and is fully automatic in operation, again making the pump operation easier.

Another area of concern for pump designers is the use of the latest materials to ensure a long pump life with reduced maintenance costs and a stonger pump construction. The modern vehicle pump will use stainless steel in the critical areas and high grade Aluminium elsewhere to provide strong resistance to the corrosion problems associated with deteriorating water quality and for use in marine environments. The inclusion of polymer wear rings is another feature to improve the pump wear characteristics.

Apart from performance and reliability issues the modern fire service is always seeking to reduce operational costs and the modern vehicle pump assists this drive by making maintenance easier and quicker – more parts are of a modular design and important parts such as seals can be accessed in-situ without major castings being removed.

Environmental concerns are increasingly influencing pump designs as fire services address issues such as fuel consumption and exhaust emissions. The more efficient a pump design is the less power it will draw from the vehicle engine, thus improving fuel use and reducing pollution.

The Godiva Prima pump (illustrated here) exemplifies all these latest design innovations and leads the way in vehicle pump design. The first production run is now reaching operational use with UK fire services and the positive reports are confirming the Godiva reputation for innovation, performance and reliability.

In addition to the two pressure discharge pump, there is now the option for a triple pressure range – this design has evolved to meet the needs of a new type of vehicle, the combined aerial rescue platform or CARP for short. This vehicle provides the water pumping capability of a standard appliance with the option to use an aerial ladder. To provide water discharge at the top of the ladder the vehicle pump has to provide a flow of approximately 2400 litres/min at 14 bar, while simultaneously supplying the hand line discharge at 1500 litres/min at 6.5 bar and the high pressure hose reels with 400 litres/min at 40 bar. A pump such as the Godiva Prima Triple Pressure Range pump is capable of supplying these discharge pressures from one unit. The Godiva pump is a modification of the field-proven World Series model, it combines the existing WT low pressure centrifugal impeller and high pressure re-generative impeller with a modified discharge manifold to provide the three different pressures. Thus making the CARP appliance a truly versatile tool.

Further notable developments of vehicle pumps are the inclusion of a Compressed Air Foam System (CAFS). CAFS is gaining increasing interest from UK and overseas Fire Brigades as a more efficient and environmentally safe method of fighting most types of combustible material fires including structural fires.

A number of Brigades are currently trailing CAFS equipment to assess the key benefits of using CAFS equipment. The main benefits can be



summarised as –

- Quicker knockdown times of fires.
- Quicker reduction of heat – cooler environment.
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- Reduced environmental damage.
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- Simple to use – no special training required.
- Reduction in firefighter fatigue due to reduced suppression time and effort.
- Less water needed.

In structure firefighting applications, a CAFS unit using Class A foam works well when applied on burning synthetic fuels associated with interior furnishings and finishes (such as foam chair padding). These synthetic fuels are hydrocarbon based and give off much higher rates of heat release and burn at higher temperatures than their non-synthetic counterparts. The benefit for first attack teams is that CAFS provides the extra punch needed to knockdown and douse dangerous synthetic burning materials.

Class A foam concentrate is classified as a synthetic detergent hydrocarbon surfactant and is related to triple strength dish detergent. Its components reduce water's high surface tension to effectively make water penetrate the crevices found on fuel surfaces. Additionally, it contains foaming agents that create bubbles when the foam solution is agitated with air, as in a compressed air foam system. The bubbles created keep the water contained within them in contact with vertical surfaces to provide efficient fuel cooling. Class A foam clings to fuels instead of rolling off, preventing the fireground water waste associated with conventional water fire streams.

When initial costs such as CAFS hardware can be proven to be a benefit, they are no longer an expense, but rather an investment. CAFS technology makes good economic sense, because it reduces property damage and increases firefighter safety.

A fire appliance equipped with CAFS contains a high-volume air compressor (50- to 200-cubic feet

per minute in size) integrated with a foam proportioning system and the normal centrifugal vehicle pump.

In a CAFS unit, foam and water are mixed at a preset proportion and then compressed air is injected into the solution, prior to discharge into the hoseline. The benefits of using CAFS, over using standard branches and foam nozzles to generate finished-foam, include higher quality finished-foam production, lightweight hose lines, increased fire stream discharge distance and finished-foam consistencies that range from "milky" wet to "shaving cream" dry. The benefits for the fire officer are increased flame knockdown capability from a limited water source, better exposure protection, less fatigue by using lightweight CAFS hoses (hoselines are filled with a partial volume of air) (hoselines penetration into burning structures to reach the core of the fire).

The potential of CAFS offers the ability to deliver large quantities of foam solution over long distances with the minimum manpower to attack structural fires that previously required massive tactical operations. Initial attack time should be reduced on most fires. For those fires which are not knocked down with the initial attack, sustained combat time should be reduced. Overhaul and mop-up times for all fires should be reduced. Implementing CAFS can significantly improve fire suppression capability.

A typical CAFS unit is the Godiva World Series with integrated CAFS, a unit where all the main CAFS components are part of the pump package – air compressor, foam pump and mixing manifold. This makes the unit easier for vehicle builders to install and connect as all parts are in one location instead of located around the vehicle structure. **APF**

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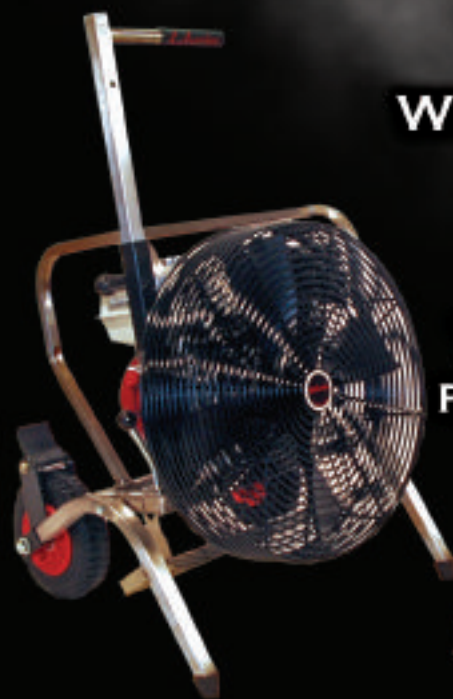
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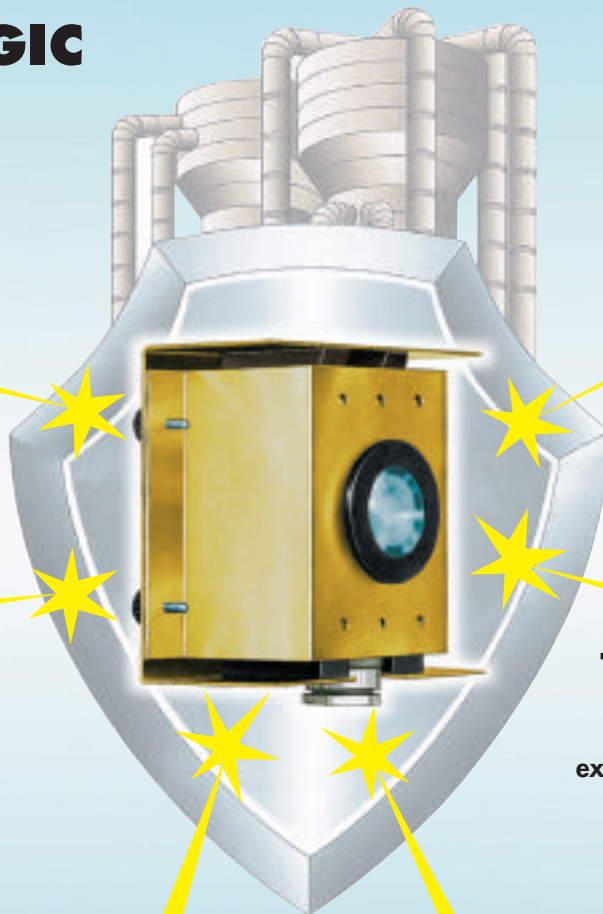


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Fire-resistant Glazing

The importance of insulation protection against the effects of fire

By **Mike Wood**

Pilkington

Transparency has obvious disadvantages in a fire. Although a transparent barrier may hold back flames, it hardly provides significant practical protection against the heat of a fire.

High levels of transmitted and radiated heat are possible in developed fire conditions which can threaten both people and property. A functional risk-based approach to fire safety design therefore has to look at the detail of how glass functions in fire in order to make a considered judgment on the consequences of using integrity only glazing and the associated design limits. The unpredictability of fire and the fundamental uncertainty of knowing what may happen should fire break out may lead to insulation performance being chosen as the decidedly safer and more effective design choice, especially for critical locations. Fire resistance should not be considered generically, and certainly not without evaluating the particular implications of either integrity or insulation performance, as these two levels of performance have totally different levels of risk and assurance against the uncertain hazards of fire.

Integrity means a physical barrier against fire, nothing more. This requires that smoke, flames and hot gases are held back. Basic integrity performance carries no assurance concerning attenuation of the heat of a fire. Integrity may be acceptable governed by the implicit assumption that escape takes place before conditions become untenable. That is before the fire grows towards flashover, assuming prompt detection, response and escape. Circumstances may dictate otherwise, however. Entirely different escape conditions may apply if the fire is more developed. Insulation performance may then be critically important for life safety – both for occupants and fire fighters – and especially for property protection since the heat exposure in developed fire conditions may become both prolonged and intense.

Most integrity glass types which remain clear in a fire can give rise to potentially high levels of



radiant heat on the protected side of the glazing. Such levels of heat may be a significant threat to people and can be capable of causing combustion of paper and synthetic materials such as those used in fixtures, fittings and furnishings. There are four particular hazards to consider:

- direct exposure to potentially high levels of transmitted and radiated heat with the risk of burns to exposed skin;
- convective heating of the atmosphere in the escape way progressively raising the risk of heat stress;
- smouldering smoke generation (before ignition) from floor coverings, fixtures and fittings in the corridor;
- secondary ignition and flaming of fixtures and fittings in the escape way as conditions approach flashover, or if flames penetrate through or round the integrity barrier.

Such risks have to be taken into account even if the integrity fire resistance of an integrity glazed element is maintained. If, for example, basic

integrity glazing extends to within only 100mm of floor level (as recommended for some cases in regulation Approved Document B, 2007, for England and Wales) then transmitted radiant heat through integrity-only glazing can produce smouldering smoke generation from floor coverings. Higher heat intensities on the non-fire side of the glazing can lead, for example, to melting of nylon net curtains, ignition of paper close to the glazing, and even melting of ceiling light covers with bursting of fluorescent lighting tubes. Only those integrity glass types which produce a measure of insulation, for example for 15 minutes within the normal standard test time of 30 minutes, are capable of limiting this possibility (e.g. those based on a glass laminate using a special insulating intumescent interlayer, such as Pilkington Pyrodur). Other clear and non-intumescent integrity glass types do not carry the same level of assurance.

Fire-resistant glass types with a full rated insulation performance for 30 minutes or longer are expressly designed to limit the heat transmission from fire by all mechanisms whilst retaining integrity. The test criteria for insulation performance classification require surface temperatures on the protected side of a barrier to be no higher than 140°C on average, with no individual point greater than 180°C. This delivers low heat levels on the protected side of the glazing, typically at a heat intensity of 1kW/m², or less, which is no more than the maximum exposure from the sun at ground level in midsummer. Not many fire-resistant glass types can meet these insulation criteria. Even a measure of full insulation performance, e.g. for only 15 minutes, represents a much better and safer option than simply integrity only.

Care also needs to be exercised in considering the new supplementary EW category provided by the European classification scheme for fire resistance. The temptation to see this category as a half way house between basic integrity and insulation should be avoided. The maximum radiation limit set by the EW category is 15kW/m² measured at 1 metre distance. This is a high level of heat exposure which, for example, provides only 2 seconds of exposure before the pain threshold is exceeded (DIN 33403-3:1988). The piloted and



non-piloted ignition of light synthetic materials also lies within this range. The classification limit also allows a wide span of measured radiant heat values to be included in the same class, for example from 3kW/m^2 to 15kW/m^2 . This is a broad range with big differences in the effects produced by radiant heat from top to bottom of the range. Also, the radiant heat as measured is sensitive to the glass radiating area and aspect ratio (which are sadly rarely stated). The EW classification cannot therefore be taken as a glass characteristic but only as a feature of the particular tested assembly. In effect, all integrity glass types (including wired glass) can be assigned an EW class depending on the radiating glass area. The EW class is therefore rather a diffuse one that blurs the boundaries between integrity and insulation; and a class that is not, as such, very useful to the functional fire safety design engineer in terms of cleanly evaluating fire risk.

A fully considered risk-based approach to fire safety design also needs to have access to a level of information that is not customarily provided by a test report or product certificate. Where judgments have to be made and risks balanced then considerations of the consistency and reliability of fire performance, whether integrity or insulation, are especially pertinent. Such information cannot be obtained from a single furnace standard test. The record of several standard tests in several systems needs to be taken into account. Experience from real fires and large scale non-standard test assemblies that are representative of likely structures are also helpful. This requires a more open dialogue with the manufacturer than is customarily the case. The mechanism of failure, in particular, needs to be taken into account (especially in functional risk-based design) as this is a key indicator of likely performance in real fire conditions. The mode of failure is critical. And each type of fire-resistant glass has its own particular mode of failure. For example, a fire-resistant glass based on standard glass laminated with a special intumescent interlayer (such as Pilkington Pyrodur and Pilkington Pyrostop) shows a slow and progressive mode of failure as each interlayer reacts in turn. The function of the intumescent interlayer is reliable and repeatable; as a result the mode of failure is essentially controllable and predictable. There is a big difference between this mode of failure and one that is characterised by sudden catastrophic failure without warning – essentially being unpredictable and therefore more subject to chance. Such a catastrophic failure mode, for example, is typical of modified toughened soda-lime-silica fire-resistant glass, with a probability of failure that can only be minimised if the glass is produced, handled and used under stringently controlled conditions.

Above all, it is critical to know that fire-resistant glass should only be installed as part of an approved fire-resistant glazed system of matched components (which includes the frame, beads, seals and fixings). What is achieved in terms of fire performance with one fire-resistant glass may not be achievable with another: tested approvals are individual approvals and apply to particular configurations, glazing pane sizes, aspect ratios, glazed area and applications. Supporting test evidence is essential. The test evidence must be relevant to the application and applicable in key respects



to the installation (e.g. pane sizes and glazing layout). There must be no temptation to install a system without applicable test evidence; any assessments used to back-up an application should be based on relevant, current and appropriate test evidence; and mixing and matching between different systems is to be avoided because the effect on performance maybe unexpected and disastrous as a result.

Time in a fire is critical. Endurance is especially crucial for the building and its contents: fire exposure may amount to several hours of intense burning. For escape, a matter of minutes or tens of minutes may be sufficient, if circumstances remain favourable. Fire development may, however, be a lot faster in reality than assumed in design; active systems may not function as intended because of system malfunction or human interference; fire intensities may be far higher than anticipated; and the fire and rescue service may not, determined by circumstance, be able to attend in sufficient time to control the fire during its early stages. Events may not turn out as ideally scripted. An assumption that what serves life safety also adequately meets the needs of property protection may be disastrously flawed. Such considerations may therefore determine at the design stage that integrity be upgraded to insulation performance, and that the classification period for insulation performance be increased from 30 minutes up to 60, 90, 120 minutes or even longer, especially if property protection is important.

Where glass requires fire resistance then insulation provides the most reliable and robust level of fire protection because of the high degree of protection that insulation affords as a barrier not only against flames, fumes and smoke but also against heat transfer which may rise to high levels in modern fires. Faced with the unpredictability of fire events and the complexity of modern buildings, the choice between insulation performance and integrity may not be a straightforward one. In the final analysis, much may depend on how faithfully the actual course of events mirrors the initial design assumptions.

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Mike Wood has more than thirty three years experience at Pilkington as a specialist who has concentrated on the behaviour of glass in fire and on the development and characterisation of fire-resistant glazing. He is the chair of the UK's Glass and Glazing Federation's fire-resistant glazing group, chair of the Fire Safety Development Group, vice-chair of the Passive Fire Protection Federation and a participant in several British Standards Institute committees on fire-related matters.

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E-mail: ben@riveriamarketing.com
Dealer/Distributor

ANSUL INCORPORATED

INDONESIA

P.T. MASTE DAYAA

Pondok Pinang Centre Blok C 16-18
Pondok Indah – Jakarta 12310, Indonesia
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Mobile: +62-0811-178993
Fax: +62-21-7511121
Email: info@mastedayaa.com
Website: www.mastedayaa.com
Dealer/Distributor

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ANSUL INCORPORATED

2 Serangoon North Avenue 5
#07-01 Fu Yu Building
Singapore 554911, Singapore
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Representative Office

BAUER COMPRESSORS

BANGLADESH

SS MOTORS LTD

TMC Building, 3rd Floor, 52 New Eskaton Road,
Dhaka 1000, Bangladesh
Contact: H.R. Khan
Tel: 880 2 9340991/2, Fax: 88029337124
Email: ssbiz@bangla.net
Dealer/Distributor

BRUNEI

BAUER COMPRESSORS ASIA PTE LTD

2 Alexandra Road, #01-03A Delta House
Singapore 159919
Contact: Stephen Hines
Tel: +65 6271 6271, Fax: +65 6272 3345
Email: info@bauer-compressors.com.sg
Representative Office

FRENCH POLYNESIA

TAHITI SPORT

PO Box 62, 98713 Papeete
Tahiti, French Polynesia
Contact: Thierry Alberola
Tel: +689 505959, Fax: +689 421775
Email: tahiti.sport@tahiti-sport.pf
Dealer/Distributor

INDIA

ALLIED SOLUTIONS (I) PVT LTD

313/314 Raikar Chambers
Jain Mandir Road, Govandi (East)
Mumbai 400 088, India
Contact: Ramesh Parasuraman
Tel: +91 (22) 6797 8056
Fax: +91 22 2557 6234
Email: ramesh@alliedsolutions.com
Dealer/Distributor

MOUNT EVEREST ENGINEERING COMPANY

A-103 Gokul Arcade Sahar Road
Vile Parle (East), Mumbai 400 057, India
Contact: Pramod Gupta
Contact: Hemant Gupta
Tel: +91 (22) 2 820 2558
Fax: +91 (22) 2 820 5792
Email: meecbom@vsnl.net
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INDONESIA

MARINE & INDUSTRIAL COMPRESSORS

304 Thomson Road
Singapore 307654
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Tel: +65 6250 6018
Fax: +65 6253 8443
Email: masmarin@singnet.com.sg
Dealer/Distributor

KOREA

TECKO CO LTD

S.K. Technopark Mega Ctr Rm 201/202
190-1 Sangdeawon-Dong, Jungwon-Gu
Sunghnam City, Kyungkido 462 705, Korea
Contact: K Y Lee
Tel: +82 0 31 776 6442
Fax: +82 0 31 776 2444
Email: kylee@tecko.co.kr
Dealer/Distributor

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SK CRYOGENICS SDN BHD

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Fax: +60 3 5192 4235
Email: skcryo@gmail.com
Dealer/Distributor

PAKISTAN

ALPINE INDUSTRIALCON (PVT) LTD

305/2 G.T. Road, Baghbanpura
Lahore, Pakistan
Contact: Kashif Ahmad
Tel: +92 42 685 2313
Fax: +92 42 655 3674
Email: alpinelaware@hotmail.com
Dealer/Distributor

PHILIPPINES

CEBU ERNBRI IMPORT, INC/ AQUAVENTURE WHITETIP DIVE SUPPLY

Ermita Office: Unit 101 Joncor II Bldg.
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Ermita Manila Philippines 1000, Philippines
Contact: Brian L Giles
Tel: +632 521 0433
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Email: masmarin@singnet.com.sg
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TAIWAN**MING SHEN ENTERPRISE CO LTD**

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Taipei, Taiwan 25170, Taiwan
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Fax: +886 (2) 2809 6189
Email: tom@3arrow.com.tw
Dealer/Distributor

THAILAND**INTERSOL ENGINEERING & TECHNOLOGY PTE LTD**

7/288 Moo 6, Chaengwattana Road
Bhanmai, Pakkred, Nonthaburi 11120
Thailand
Contact: Mr. Nathanan
Tel: +66 2 9808754
Fax: +66 2 9808756
Email: nathanan@intersol.th.com
Dealer/Distributor

VIETNAM**FRANCO-PACIFIC VIETNAM CO LTD**

55 Ho Hao Hon Street, District 1
Ho Chi Minh City, Vietnam
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Tel: +84 8 836 0257
Fax: +84 8 836 1387
Email: colminogue@francopacific.com
Dealer/Distributor

MEKONG SCUBA SUPPLY LTD

2/14 Cao Thang Street
District 3, Ho Chi Minh City, Vietnam
Mr Mike Doyle
Tel: 848 832 8952
Fax: 848 832 8650
Email: mikedoyle44@hotmail.com
Dealer/Distributor

BRISTOL UNIFORMS**AUSTRALIA****PACIFIC HELMETS AUSTRALIA PTY LTD**

Abn 60 088 233 783
Unit 1/28 Burnside Road
Hallmarc Business Park
Yatala Qld 4207
Contact: Keith Ward
Tel: 1300 73 1800
Fax: 07 3441 7177
Email: keith@pacifichelmetsaust.com
Website: www.pacifichelmetsaust.com
Dealer/Distributor

BANGLADESH**MANIK BROTHERS**

Hai Mansion (3rd Floor)
9/3 Motijheel Circular Road, Dhaka – 1000
Bangladesh
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Tel: +880 2 7100 589
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BRUNEI**DASAPREM (M) SDN BHD**

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Tel: +603 550 9060
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Email: dasaprem@yahoo.com
Website: www.dasaprem.com
Dealer/Distributor

CHINA**SHENZHEN RUFN INDUSTRIAL CO LTD**

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1st Fuhua Rd, Shenzhen, China
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FIJI**PHILLIPS & SMITH LIMITED**

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Website: www.firemaster.co.nz
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HONG KONG**CHUBB HONG KONG LIMITED**

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Hung Hom
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Website: www.chubb.com.hk
Dealer/Distributor

INDIA**FOREMOST MARKETING PVT LTD**

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New Delhi 110016, India
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Email: foremost@vsnl.net
Website: www.foremostsafety.com
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JAPAN**ABLE-YAMAUCHI CO LTD**

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NEW ZEALAND**PHILLIPS & SMITH LIMITED**

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Website: www.firemaster.co.nz
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SINGAPORE**YEN LEE FIREWELD PTE LIMITED**

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SRI LANKA**FIRETECH (PRIVATE) LIMITED**

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Nawala, Sri Lanka
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TAIWAN**SHENG-TAI FIRE PROTECTION INDUSTRIAL CO LTD**

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Taipei, Hsien, Taiwan
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Tel: +886 22292 1751
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Email: sato@mail.mold.net.tw
Website: www.shengtai.com.tw
Dealer/Distributor

VIETNAM**TRAN VU TRADING CO LTD**

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Hochiminh City, Viet Nam
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Tel: +84 88325101
Fax: +84 88309586
Email: sales@tranvufire.com
Website: www.tranvufire.com
Dealer/Distributor

DRAEGER SAFETY**AUSTRALIA****DRAEGER SAFETY PACIFIC PTE LTD**

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Representative Office

ELKHART BRASS**AUSTRALIA****FIRE RESPONSE PTY LTD**

71 Prince William Dr
PO Box 668
Seven Hills 2147, Australia
Tel: +61 2 9838 9071
Dealer/Distributor

INDONESIA**PT REJECKI UTAMA**

Wisma Geha, 5th Floor
JL Timor 25, Jakarta, Indonesia
Tel: +62 21 316 2779
Dealer/Distributor

NEW ZEALAND**PSL PHILLIPS & SMITH LTD**

PO Box 69-028
Glendene, Auckland
New Zealand
Tel: +64 9 8184484
Dealer/Distributor

THAILAND**GUARDFIRE LIMITED**

42/2 Teo Hong Bangna Building
Moo 10, Bangna-Trad Road
Bangkok 10260, Thailand
Tel: +66 2 7467031
Dealer/Distributor

FIKE**AUSTRALIA****FIRE PROTECTION TECHNOLOGIES PTY LTD**

Unit 14, 42-44 Garden Blvd
Dingley
Victoria 3712, Australia
Tel: +61 3 9558 0715
Fax: +61 3 9558 0725
Email: Enquiries@fire-protection.com.au
Website: www.fire-protection.com.au
Dealer/Distributor

BANGLADESH**NAVANA INTERLINKS LTD**

205-207 Tejgaon I/A
Dhaka-1208, Bangladesh
Tel: +88 02 -9892911
Fax: +88 02 -9895252
Email: info@navana-iv.com
Dealer/Distributor

HONG KONG**THE JARDINE ENGINEERING CORPORATION LTD**

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Taikoo Place
979 King's Road, Hong Kong
Tel: +852 2807 4562
Fax: +852 2503 4210
Email: Keith.lam@jec.com
Website: www.jec.com
Dealer/Distributor

INDIA**NEWAGE INDUSTRIES**

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Sion (East), Mumbai 100 022, India
Tel: +91 22 2407 7421
Fax: +91 22 2407 4229
Email: info@newage-india.com
Website: www.newage-india.com
Dealer/Distributor

INDONESIA**KARYA LESTARI MAKMUR PT**

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Indonesia
Tel: +62 21 628 1933
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Dealer/Distributor

KOREA**PARADISE INDUSTRY CO LTD**

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Seoul, South Korea
Tel: +82 2 3780 8770
Fax: +82 2 3780 8772
Email: shlee@paradise-ind.co.kr
Website: www.paradise-ind.co.kr
Dealer/Distributor

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Fax: +60 3 7859 1461
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SUKIADA ENGINEERING SDN BHD

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Selangor, Malaysia
Tel: +60 3 7845 2008
Fax: +60 3 7845 6008
Email: sukiada@sukiada.com.my
Website: www.sukiada.com.my
Dealer/Distributor

PAKISTAN**MGH ENGINEERING AND CONTROL PVT LTD**

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Lahore 54950, Pakistan
Tel: +92 - 42 - 7913064
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Email: mansoorshaker@yahoo.com
Website: www.mgheng.com
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PHILIPPINES**FIRE SOLUTIONS INC**

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60 West Avenue
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Dealer/Distributor

SINGAPORE**FICON PTE LTD**

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SRI LANKA**BUILDING SERVICES (M&E) ENGINEER INTERNATIONAL PVT LTD**

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Fax: +886 2 2550 5350
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Website: www.sunmoreinc.com
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Fax: +66 2 258 2422
Email: sithichai@antifire.com
Website: www.antifire.com
Dealer/Distributor

FIRE FIGHTING ENTERPRISES**AUSTRALIA****AMPAC INDUSTRIES PTY LTD**

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Tel: +61 892 423 333
Fax: +61 892 423 334
Website: www.ampac.com.au
Dealer/Distributor

BAHRAIN**KHAYBER TRADING COMPANY**

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Manama
Bahrain
Email: FX ABB 50
Dealer/Distributor

CYPRUS**M.T. PIPERARIS TRADING LTD**

Nafpactou 19a
Lemesos 3051
Cyprus
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Fax: +357 5 737310
Dealer/Distributor

HONG KONG**HLK SERVICES LTD**

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Hung Hom Commer'1 Centre
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Hung Hom, Kowloon
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Fax: +852 23656128
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INDIA**NITIN FIRE PROTECTION**

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Hiranandani Gardens
Powai, Mumbai -400 076
India
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Fax: +91 22 25701110
Dealer/Distributor

ISRAEL**AAP TECHNOLOGY LTD**

84, Ben-Tzvi Road
Panarama House
61364 Tel-Aviv
Israel
Tel: +972 3518 1444
Fax: +972 3518 1445
Dealer/Distributor

TELEFIRE FIRE & GAS

Detectors Ltd
P.O.B 7036
Petach-Tikva 49250
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Tel: +972 3 9211955
Fax: +972 3 9211816
Dealer/Distributor

IRAN**NAR KOOB IRAN**

Apt 7, 3rd Floor, No 32
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St.Ostad Motahari Ave.
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Dealer/Distributor

KOREA**HI MAX CO LTD**

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Sangdaewon-Dong
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Email: khkim@himax119.co.kr
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MALAYSIA**FITTERS ENG SERVS SDN BHD**

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Malaysia
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Dealer/Distributor

NEW ZEALAND**AMPAC INDUSTRIES LIMITED**

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Glenfield, Auckland
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Fax: +64 94438073
Dealer/Distributor

QATAR**AL SHAIBEH ESTABLISHMENT**

P.O. Box 3975
Doha
Qatar
Tel: +974 4322140
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Dealer/Distributor

SINGAPORE**ACCLAIM SYSTEMS PTE LTD**

Blk 104 Boon Keng Road
05-01 Singapore 339775
Tel: +656 2990 798
Fax: +656 299 3735
Dealer/Distributor

ALARM SUPPLY PTE LTD

63 Jalan Pemimpin
03-07 Pemimpin Industrial Bldg
Singapore 577219
Tel: 00 656 258 3445
Fax: 00 656 258 6428
Dealer/Distributor

SRI LANKA**FIRETECH (PVT) LTD**

34, Walter Gunasekara
Mawatha, Nawala
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Tel: +94 1 806613
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SYRIA**ESS COMPANY**

Po Box 35478
Damascus
Syria
Dealer/Distributor

TAIWAN**HORING LIH IND CO LTD**

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Sec 2 Chung-Ho-City
Taipei Hsien
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THAILAND**F.B. (THAILAND) LTD**

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TEEYA MASTER SYSTS CO LTD

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Rama 9 Road, Huaykhwang
Bangkok 10320
Thailand
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Dealer/Distributor

UNITED ARAB EMIRATES**BAHRI & MAZROEI TRADING CO**

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NAFFCO

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TELECTRON

P.O. Box 2946
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HOLMATRO RESCUE EQUIPMENT

AUSTRALIA**CHUBB FIRE SAFETY LTD**

120, Silverwater Road
Silverwater
NSW 2128
Locked Bag 102
Silverwater 1811
Contact: Andrew Loftus
Tel: 1300 369 309
Fax: 02 8748 7450
Email: firesafety@chubb.com.au
Website: www.chubb.com.au
Dealer/Distributor

HONG KONG**ABLESLINK CO LTD**

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3 Ka Fu Close
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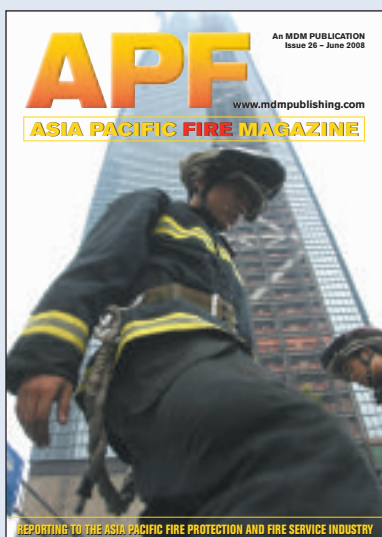
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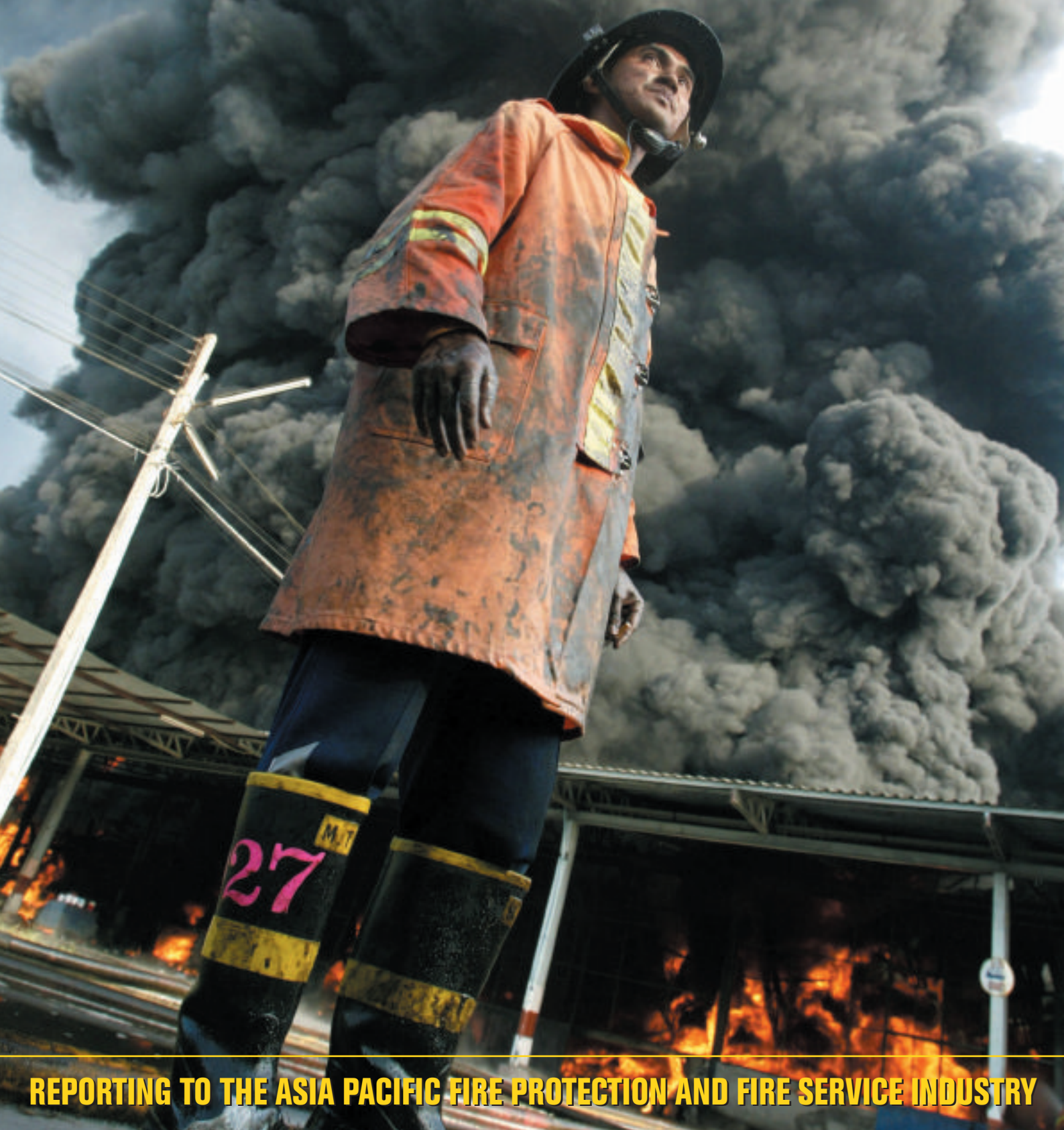
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ASIA PACIFIC FIRE MAGAZINE



REPORTING TO THE ASIA PACIFIC FIRE PROTECTION AND FIRE SERVICE INDUSTRY

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ATEX Version Available 6000 l/min Typhoon Remote Controlled and Manual Monitor

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- Only 1.3 bar friction loss at 6000 l/min
- Field Changeable Stops



ATEX Version Available 8000 l/min Monsoon Remote Controlled and Manual Monitor

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- Maximum Operating Pressure 14 bar
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September 2008 Issue 27



Front Cover Picture: A firefighter stands in front of a burning rubber plant in the southern province of Yala, 1,200 km (746 miles) from Bangkok, February 21, 2007. Militants lobbed fire bombs overnight into the export-oriented warehouse and smoking plant, the largest one in the three southernmost provinces. REUTERS/Surapan Boonthanom (THAILAND)

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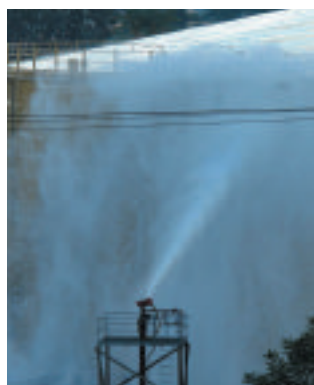
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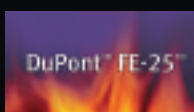


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By Olga Caledonia

Executive Director
International
Operations, NFPA

Foreword

Up, Up but Not Away (with Safety)

As the popular song from the 1970's implied, you could travel *up, up and away in my beautiful balloon*. In 2008, you simply need a reliable and dependable elevator to travel a startling vertical distance of 620m – more than a third of mile into the sky. The Burj Dubai is presently the tallest building in the world – and it has still not been topped out – it is likely to get even higher. With a scheduled opening in early 2009, the Burj is anticipated to be in the neighborhood of 620m (1,850 feet). Not to be outdone, developers and governments alike in the Middle East and Asia are eyeing plans to go even higher than whatever the ultimate height of the Burj will be.

While the west has slowed its desire for super tall structures, projects are nonetheless underway in Chicago and New York among other cities to deliver some unique high rise buildings. Unlike design and construction approaches for high rise buildings in the 1960s and 1970s, the safety of the occupants is a prime concern rather than an afterthought. Building floor plate design now days is tied as much to the travel distance to the exits as it is to the functionality of the space. Arguments over the need for automatic sprinklers are non-existent. Sprinklers are just as much a part of the accepted features in any high rise building as is the elevator, or the walls or the ceiling.

In fact, enhanced features like voice communication systems and robust systems to improve first responder communications within the high-rise environment are all part of the safety features that make these structures among the safest in the world. Newly developed concepts for the high rise environment include occupant evacuation elevators, first responder elevators and introduction of the *situation awareness* concept. These provisions will be in the latest editions of NFPA 101 and NFPA 5000 and point to NFPA's commitment to keep improving upon the range of safety features that are available to the building occupants and the first responders.

Plans for the recently announced Farrer Road residential development in Singapore will include seven, 36 story buildings making it the largest residential development in Singapore. The twisted and tapered design of the Central China Television (CCTV) headquarters building in Beijing received attention during global broadcast of the 2008 Summer Olympics. Application of the NFPA codes to these unique designs may also call for unique solutions to the fire safety needs of the occupants. In addition to fixed asset systems and features, the

Farrer Road towers, CCTV and the Burj Dubai alike also require a comprehensive emergency plan for the hundreds or thousands of occupants who will live or work in these buildings. Select projects in the Middle East have applied the principles contained within NFPA 1600, *Standard on Disaster/Emergency Management and Business Continuity Programs* to address the planning components should it become necessary to relocate or evacuate occupants.

The membership of NFPA, has an obligation to encourage use and adoption of the NFPA codes and standards that are continuously evolving to address the current hazards and risks that are typical in the high rise environment. NFPA 101®, *Life Safety Code®* and NFPA 5000®, *Building Construction and Safety Code®* have been updated in recent years to respond to several of the recommendation that came out of the federal investigation of the World Trade Center attacks in 2001. As we approach the seven year anniversary of that event, a final report on the demise of WTC Building 7 was just released on August 21, 2008. NFPA Technical Committees will be reviewing to that report to see what if any, other changes are needed to be made to the 300 NFPA codes and standards.

We can expect to see taller and taller structures, but we will continue to see appropriate levels of safety embedded in these buildings. As technologies change, the fundamental mission of NFPA will still be applicable to *reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating consensus codes and standards, research, training, and education*. Perhaps no other building embodies the need for the four main attributes of this mission than a high-rise. We can go up, up and away, with safety securely tethered to the building design principles and concepts.



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IFSEC India returns this year to offer you the tailored support, advice and networking opportunities your business needs to excel in this booming market.

Over 170 exhibitors and 8,000 visitors from 56 countries attended the inaugural event in 2007. Still serving as the only international security event in the south Asian region, this year's show looks set to be even better with the launch of co-located exhibition Firex India – an extension of the successful Firex group of events.

IFSEC and Firex India 2008 promises a host of visitor attractions:

- 150 world leading exhibitors already confirmed
- Live demonstrations of the latest technologies
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Skum™ protection for new Jebel Ali storage terminals

A complete fire detection and SKUM™ foam fire firefighting system has been supplied to UAE-based Consilium Middle East (FZC) and installed to protect the new EMOIL petroleum storage and the new EMDAD aviation fuel storage and distribution terminal at the Jebel Ali Free Zone in Dubai. It comprises foam skids, foam tanks, foam pourers, bund pourers, a deluge system, an LHS linear heat sensor detection system, and a hydrant system, together with foam and water monitors and AR-AFFF 3x3 alcohol-resistant aqueous film-forming foam concentrate.

Installed primarily to protect hydrocarbon storage tanks, pump houses and truck loading bays at the storage terminal, the integrated installation also safeguards the pipeline that supplies aviation fuel to Dubai International Airport. EMOIL is a joint venture between Emarat [Emirates General Petroleum Corporation], BP Global Investments, and Trafigura Beheer, while EMDAD is a joint venture between Emarat, Air BP and Shell. Installation of the SKUM equipment was undertaken by the Italian engineering, procurement and construction specialist, Belleli Energy.

The facility is being used for both blending and storing gasoline products to meet Emarat's own requirements for high quality gasoline, as well as supplying local and regional markets. Built on a 46,000 square metres site, it includes nine storage tanks with a total capacity of 228,000 cubic meters. Of this, the aviation fuel storage facility has a 155,000 cubic metre capacity tank farm and includes a 57-kilometre cross-country 300mm diameter pipeline to transport the jet fuel direct to the airport.

Fredric Pettersson, Regional Sales Manager for foam and foam hardware at Tyco Fire Suppression & Building Products, Middle East, points to the ability to provide a single-source supply solution comprising both the foam agent and the delivery system as a key factor in securing the order. He comments: "SKUM is very much in the solutions business, so it has amassed a huge bank of knowledge in terms of the risks inherent in this type of strategic, high value, high hazard site. This has allowed us to develop a fire safety model for the terminal that is in around-the-clock readiness to react instantly to any spillage or fire emergency on the site."

The importance of this capability is endorsed by Mr M. M. Usman, Operations Manager for the Terminal, who comments: "Health, safety and environmental issues are very important in an environment such as this and we have very high standards, which are strictly enforced, according to both industry standards and those of the



joint venture partners,"

The SKUM brand is recognised globally as the industry's leading provider of dependable and efficient firefighting solutions for high value, high risk petrochemical, aviation, marine and power plant applications.

Further details on SKUM – Skum is the Swedish word for foam, which is pronounced "skoom" – solutions and expertise can be found at www.skum.com, or are obtainable by email on tspmarketing.emea@tycoint.com and by telephone on +46 303 57700

New South Wales Fire Brigade Bring Remploy To The Disaster Response Frontline

The New South Wales (NSW) Fire Brigade has announced that it purchased an undisclosed number of Cougar suits from the global leader in personal protection equipment (PPE) *Remploy Frontline*. The Cougar PPE ensemble will allow the NSW Fire Brigade to better respond to, and manage, a host of incidences – from toxic industrial chemical spills to terror attacks.

Remploy's PPE solution reduces direct personnel contamination and cross-contamination on- and off-site. The Remploy suits were chosen because they provide unparalleled protection and mobility whilst providing significantly lower body burden than most PPE available today.

A member of the NSW Fire Brigade that tested the suits said: "Cougar's physiological burden was quite low, especially considering that we were fully-operational in a hot tropical climate – it felt like we were just wearing regular uniforms."

As part of Remploy's new customer-centric approach, the Cougar suits are part of an integrated ensemble solution for its customers, making certain that everything from boots to headgear is tightly fit together.

Whilst the CBRNE (chemical, biological, radiological, nuclear and explosives) threats are significantly less in Australia than they are in the US or other NATO / EU countries, a senior spokesperson at the NSW Fire Brigade said they are starting to become accustomed to training and preparing for various CBRN-related threats.

Remploy Frontline Global Business Manager John Armstrong said: "These purchases for New South Wales demonstrate three things... First, it demonstrates that CBRNE PPE is now compulsory for all emergency services worldwide. Second, it shows that the civilian sector must have the highest quality CBRNE PPE available when responding to, and managing, an emergency situation. Third, this reaffirms Remploy's commitment to growth in the Asia-Pacific region."

For more information, please visit www.rememployfrontline.com

Sperian Protection Group

Within the SPERIAN PROTECTION GROUP – world leader in PPE market – the Fenzy range is specialized in the field of open and closed circuit respiratory equipment, starting from disposable half-masks to long duration SCBA.

With more than a century of safety expertise and innovation culture, Sperian Respiratory Protection France, through its Fenzy range, is one of the breathing apparatus business leaders on the market.

Working in close collaboration with fire brigades and industry professionals, has resulted in the design of performing reliable and latest advanced technology apparatus.

One of our latest effective innovations is our telemetry system the Fenzy Angel-Metry, which can transmit all safety parameters of our Fenzy Self-Contained Breathing Apparatus (SCBA): Temperature, remaining duration, pressure, Alarms...

It reinforces the safety of your Firemen when they go into mission, as you keep an eye permanently on them remotely using a



data broadcast.

The Fenzy Angel-Metry base station comprises different electronic devices equipped with electronic intelligence intended to transmit in real time the information shown on the display of the Fenzy Angel-Metry transmitter device mounted on the SCBA shoulder strap to the Fenzy Angel-Metry monitoring station computer, via one or several Angel-Metry relay stations.

Depending on the distance and obstructions between the Fenzy Angel-Metry transmitter device(s) and the Fenzy Angel-Metry monitoring station, other Fenzy Angel-Metry relay stations can be stand with supports on the ground. All of them are independent and communicate between themselves. In case of danger, it is possible to activate an individual or common recall signal from outside.

Fenzy Angel-Metry relay stations are available so that the signal is never lost between the Fenzy Angel-Metry transmitter devices and the Angel-Metry monitoring station, even

on areas where signal spreading is much more difficult (car parks, confined spaces...)

Effective innovations for a maximum safety this is our mission.

For more information, please contact us:
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 Website: www.sperianprotection.com

Contract Award – Simulation win Contract in Saudi Arabia

SIMULATION, based in Staffordshire, UK (www.simulation.uk.com) have recently been awarded a contract to

provide a Maritime Fire Training Unit to the Faculty of Marine Science, King Abdul Aziz University in Jeddah. "We are pleased to announce that we have been selected by the university in Jeddah to deliver this Maritime Fire Training Unit. This marks another milestone in the achievements of our company as traditionally we have a very strong position in the aviation sector with the supply of state of the art aircraft fire training simulators, as we are now providing university establishments in the middle east region." Work has already commenced on the construction phase of the project and completion and handover of the facility is planned for December 2008. The maritime fire training units consists of a range of internal compartments of a ship and the unit is multi-level. There are a total of 7 internal lpg fires. These fire scenarios will be Deck 1 – Engine Fire, Split Flange Fire, Fuel Spill and on Deck 2 there will be a Bed Fire, Cooker Fire, Cooker Spill and Ceiling Rollover Fire. All fires scenarios will be LPG. There will be a fixed fighting system with outlet points on both Deck levels. There will be full PLC computer controlled safety and fire control management system including electronic ignition, gas monitoring, temperature monitoring, mechanical extraction, data logging and alarms. Steve Fahey, Managing Director continues "This project will be the first we have supplied to a university in the Middle East and it is anticipated that many more opportunities for product development and supply will follow in the months and years ahead in this region."

For more information visit our website www.simulation.uk.com



Trellchem® VPS-Flash protective suit – gains NFPA 1991-2005 and optional chemical flash fire certification

TRELLEBORG PROTECTIVE PRODUCTS, a product area of Trelleborg Engineered Systems, announces the next generation of Flash Protective Hazmat Suits, the Trellchem® VPS-Flash. This is fully certified to NFPA 1991-2005 and has also gained optional chemical flash fire certification. This unique certification was achieved with a single skin, providing better maneuverability and comfort to the wearer.

The new Trellchem® VPS-Flash is a reusable, single skin, one layer suit. It is certificated to NFPA 1991-2005 and has also gained optional chemical flash fire certification. In the tests required for this, the suit far exceeded the minimum requirements. In the Overall Ensemble Flash Test, following exposure to a six to eight second flash fire, the suit held pressure and passed a visual acuity test of 20/100 or better. To pass the Flammability Resistance Test, following a series of burns, the suit must self extinguish after two seconds. In fact, the Trellchem® VPS-Flash did not ignite.

This unique certification was achieved with a single skin suit. This gives the benefits of better maneuverability and comfort to the user, as compared to a suit with an over cover.

The Trellchem® VPS-Flash is made of a new patent pending material. This combines specialized rubber and plastic laminates with a special woven fabric, forming a strong and flexible material that offers outstanding chemical flash fire protection. In addition this material exhibits excellent resistance to abrasion, punctures, tears and superior chemical resistance properties.

The suit comes with the following as standard:

- Impact Resistant Hard Visor
- Superior Neoprene closure
- Easy Don/Doff Bayonet Cuff System
- High-Visibility Orange Color
- Optional Anti-Fog Lens (virtually eliminates all condensation!)
- Highest material abrasion resistance

For more information, please contact:
Trelleborg Protective Products
 Tel: +46 410 510 00
 Website: www.trelleborg.com/trellchem

PBI Performance Products celebrates 25 years

PBI Performance Products Inc.

Since opening its doors in 1983, PBI Performance Products Inc. has experienced a high level of success as the world's only producer of the polybenzimidazole (PBI) fiber.

Manufacturing the PBI Gold®, PBI TriGuard™ and PBI Matrix®, PBI Performance Products strives to protect workers in the fire service, industrial, military and special operations industries from the dangers associated with heat and flame. With 25 successful years behind the company, the employees at PBI are proud of where they are today, and see a lot of opportunities for the next 25 years.

The history of the PBI fiber and polymer dates back to 1961, when H. Vogel and C.S. Marvel first synthesized PBI and discovered its ability to maintain exceptional thermal and oxidative stability. After the crew of the Apollo 1 was killed due to a fire during a prelaunch test in 1967, NASA began searching for a flame-resistant material to use in the flight suits. In 1969, after discovering Vogel and Marvel's research papers, NASA started using the PBI fibre to protect its astronauts, marking the first time that PBI was used to offer protection from fire.

The PBI polymer gained an even wider acceptance when, in 1978, the International Association of Firefighters (IAFF) published its Project FIRES (Firefighters Integrated Response Equipment System) report. The report stated that a blend of 40-percent PBI/60-percent Kevlar provided high tear strength and high heat resistance. "Project FIRES was a very important report, and it really put PBI fibre on the map in the fire service industry," said Grant Reeves, PBI's president. According to William Lawson, PBI's managing director and COO, PBI gained an even larger share of the U.S. fire service industry when the New York City Fire Department switched to PBI in 1994.

In 1996, PBI began selling globally and today, the company's products have gained a global acceptance as being the highest performing dimensionally stable, flame-resistant fibre on the market. PBI reached another milestone in 2005 when The InterTech Group Inc., owned by Jerry Zucker, purchased the company, giving it new life and a new mandate to grow and fulfill its global potential. "The new ownership has allowed the company to expand geographically and technologically, and there is a commitment to expand that technology," Reeves said. "Jerry Zucker saw great



potential for the business and re-energized our work force to strive for higher goals," Lawson said. "Sadly, Mr. Zucker recently passed away and while we will miss him, his vision for the business has been deeply rooted."

That vision, shared by Reeves, sees PBI as being the pre-eminent level of protection for firefighters globally. "We also see PBI as a material that is destined to play a major role in our space program, and as a material that will replace quartz, ceramics and some metals in the electronic and semiconductor industry," he said. "Perhaps most importantly, PBI will also be a solution in cleaning the environment, whether it's separating carbon dioxide from natural gas or making ethanol distillation more efficient. "We also see PBI as diversifying into military applications where the threat from flash burn is the primary threat, and we see growth from the international acceptance of PBI," he said. "We know there are many markets that are in need of higher performance materials," Lawson said. "As those needs become more apparent, we believe PBI will either be the solution or be part of the solution."

To commemorate its 25-year anniversary, PBI will celebrate with customers, loyal partners and employees throughout the year.

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Introduced more than two decades ago, genuine FIRETRACE® stand-alone automatic fire suppression systems for micro environments are today cost-effectively protecting over 65,000 pieces of business-critical equipment, electrical enclosures, cabinets, machinery housings and technical systems around the world. By providing reliable around-the-clock unsupervised protection, FIRETRACE stops a fire before it can do expensive and possibly irreparable damage to vital equipment or produce volumes of life-threatening smoke and toxic fumes.

Increasingly, organisations are becoming alert to the need to safeguard high-value key assets. They are aware that what is often at stake is far more than the cost of replacement, as losing the asset may well jeopardise the organisation's ability to meet its contractual obligations, damage customer confidence – potentially even put the organisation's very survival at risk. The only way to avoid this is to ensure the shortest possible gap between a fire, its detection and suppression.

But what is FIRETRACE and how does it work? Genuine FIRETRACE is an automatic self-seeking fire extinguishing system that comprises an extinguishing agent cylinder attached to proprietary Firetrace Detection Tubing via a custom-engineered valve. This small-bore polymer tubing is a linear pneumatic heat and flame detector that was specially developed to deliver the desired temperature-

sensitive detection and delivery characteristics. The leak-resistant tubing quickly detects a fire at its source, ruptures and automatically releases the suppression agent, extinguishing the fire precisely where it starts and before it can take hold.

Significantly, unlike conventional “point” detectors that can take time to activate, FIRETRACE detects along the entire length of the tube. The flexibility of the proprietary tube means that hard to reach areas do not present any problems; it can be “snaked” through the smallest or most complex enclosures, providing protection wherever it is needed. The FIRETRACE Detection Tubing's unique properties enable it to endure harsh environments – from the dirt heat and vibration of an engine enclosure to chemical attacks from elements used in fume cupboards.

To provide the best protection for the specific

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Email: info@firetrace.com
Website: www.firetrace.com

s reliable nt" Protection

fire risk, FIRETRACE is installed along with the most appropriate fire suppression agent for the particular hazard. It can be supplied with most commercially available agents and is ideal for Class A, B, C and D fires. The particular agent is selected following a careful assessment of the hazard and is chosen to ensure that the discharge of the agent does not itself damage the asset being protected.

Currently, FIRETRACE agents include dry chemicals, CO₂, foam, water and a range of clean and environmentally-acceptable chemical agents, including FM-200® and 3M™ Novec™ 1230 Fluid. Every FIRETRACE installation is entirely self-contained and is in a state of constant around-the-clock readiness. It requires no electrical power and no expensive control panel; its cost-effectiveness is further boosted by the fact that it can be installed quickly and simply and the maintenance requirement, although important, is minimal.

FIRETRACE systems can be configured for either direct release or indirect release, and are available as either a low-pressure or high-pressure system. The choice depends upon the type of enclosure, the particular fire hazard and the suppression agent selected. The Direct Release System utilises the FIRETRACE tube as both the detection device and the suppressant delivery system. If a fire breaks out, the tube ruptures nearest the point where the most heat is detected, forming an effective spray nozzle that releases the entire contents of the cylinder to suppress the fire.

The Indirect Release System is typically used in larger areas requiring a higher volume of extinguishing agent. It uses the FIRETRACE tube as a detection and system activation device, but not for the agent discharge. The rupturing of the tube results in a drop of pressure causing the indirect valve to activate. This diverts flow from the detection tube and the agent is discharged from the cylinder through diffuser nozzles, flooding the entire enclosure. High pressure FIRETRACE systems allow high pressure suppressants, such as CO₂ and Nitrogen to be utilised.

This versatility and effectiveness has led to FIRETRACE being used in an ever increasing range of industrial, on-road and off-road vehicle and mass transit market sectors. Applications such as electrical panels, laboratory fume cupboards in the pharmaceutical, oil, gas and chemicals industries, bus engine compartments, CNC and other workshop machinery are now commonplace. So too are applications within the mining industry, power generation, remote telecommunications installations, wind turbines and the protection of cable trays.

Much of this increasing popularity is down to the reliability and build quality of the genuine FIRETRACE product, the investment that Firetrace International continues to make into ever more efficient fire protection solutions, and the number of major international listings, approvals and accreditations the systems have amassed. These



include such organisations as UL [Underwriters Laboratories], FM [Factory Mutual], NFPA [National Fire Protection Association] and more than 25 other internationally renowned and independent accreditation and approvals agencies.

Indeed, it is this combination of quality, expertise and approvals that differentiates genuine FIRETRACE products manufactured by Firetrace International from those supplied by companies that have taken advantage of the FIRETRACE name, brand and reputation to offer inferior products that lack any form of testing, third-party accreditation or approval. Often these non-authorised tube-based "imposter" products are not installed to the established FIRETRACE guidelines, utilise inappropriate suppression agents, incorporate sub-standard detection tubing, and are not backed with adequate post-installation technical support.

The result is a detection and suppression installation that may fail when it is most critically needed, converting any small cost saving when compared with the genuine article into the potentially crippling loss of a mission-critical asset. Worse, it may result in allowing the fire to spread, risking damage to other assets or threatening lives. For this reason, Firetrace International has created a global network of authorised FIRETRACE distributors. These trading partners are skilled in hazard analysis, agent and system selection, installation, commissioning and support. They also use only genuine FIRETRACE components. Details of these authorised distributors are available by contacting Firetrace International at info@firetrace.com. **APF**

Torrent of interest in new Ansul Thunderstorm Foam

ANSUL® has teamed up with Williams Fire and Hazard Control Inc to develop THUNDERSTORM® ATC 1 x 3, a new generation of alcohol resistant AFFF foam concentrate. It is specifically designed to fight fires in oil refineries, where there is never any scope for compromise or second best.



THUNDERSTORM uses new technology and has a dramatically reduced viscosity when compared with other 1 x 3 listed polar-solvent type AFFF concentrates on the market. This enhances the foam's performance in all types of foam proportioning equipment, including in-line eductors, balanced pressure systems and vehicle-mounted, built-in systems.

It can be used as a three percent solution on fires involving polar solvents, such as acetone, methanol and methyl ethyl ketone, and a one percent ratio on fires involving hydrocarbons such as high-octane petrol, aviation fuel and naphtha. These are the two most common types of flammable liquid fire that can occur in an oil refinery, and these low ratios simplify foam storage and dispersment around the site, and greatly increase the "staying power" of both fixed and mobile firefighting foam systems.

Other characteristics of the new foam include the speed at which it spreads across the surface of a tank fire and seals against the hot metal surfaces on the inside of the tank. Its excellent wetting characteristics also make it ideal for fighting Class A fires. High volume streams of THUNDERSTORM can be discharged from foam guns – located several hundreds of metres away from the tank – without causing turbulence when it hits the surface; the foam has good fuel shedding capabilities to extinguish the fire without knocking a hole in the foam blanket.

THUNDERSTORM extinguishes a fire in three ways. First, with a fire involving a conventional hydrocarbon fuel, an aqueous film is created; in a polar solvent fire, a polymeric membrane is formed. This film or membrane creates a barrier to help prevent the release of fuel vapour. Second, regardless of the type of fuel, a foam blanket is formed that excludes oxygen and from which drains the liquids that form the film or the polymeric membrane. Third, the water content of the foam produces a cooling effect.

THUNDERSTORM can be used with fresh, salt or hard water, and is formulated to ensure ease of use and considerable savings in weight and volume.

Further details can be found at www.ansul.com, or are obtainable by email on tspmarketing.emea@tycoint.com

Bristol appoints Pacific Helmets Australia as its distributor for firefighter PPE in Australia

As part of its expansion strategy in the southern hemisphere, BRISTOL UNIFORMS has recently appointed Queensland based Pacific Helmets Aust to handle market development and the distribution of its firefighter protective clothing across Australia.

Bristol, recognised as a leading international innovator and manufacturer of firefighter PPE, now supplies its range of protective clothing to firefighters in 110 countries around the world through an expanding network of specialist distributors serving the emergency services. Pacific Helmets Aust (PHA) were carefully selected to support Bristol's plans to grow its presence in the Australian market and join a network of over 70 distributors who together handle round 50% of the company's business which comes from overseas.

Commenting on the new partnership between his company and Bristol Uniforms, Managing Director Keith Ward explained PHA's background when he said, "Pacific Helmets Aust P/L was established in 2000 by Keith and Kerrie Ward. Keith has had 30 years experience in the fire equipment supply industry. PHA is one of Australia's largest independent supply companies and distributes a number of quality products e.g. Siebe Gorman, ESKA gloves, Life Liner hoods, E2V Argus 4 TIC and Pacific Helmets to name but a few. We are a major contract supplier to all of the Australian metropolitan and rural fire services and have established ourselves by providing prompt service and quality certified



products". He added, "Our decision to establish links with Bristol Uniforms will reinforce our commitment to distribute quality certified fire clothing to the Australian fire industry. We are excited and proud to be the Australian distributor for Bristol. For more information about us do visit our web site www.pacifichelmetsaust.com".

Roger Startin, Bristol's Joint Managing Director commented, "Interest in our new generation of lightweight structural kit in the form of the Ergotech™ and Ergotech Action™ ensembles and the recently introduced wildland firefighting PPE based on Ergotech™ design principles suggests there is a significant potential market for these class leading products in Australia. We are pleased to have Pacific Helmets Australia as our new partners to help drive forward our sales development programme there".

For more information, please contact:
Bristol Uniforms Ltd.
Tel: +44 117 956 3101
Email: roger.startin@bristoluniforms.com

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- 3 Project Engineer and**
- 4 AutoCad Design Draughtsperson**



Experience with the industry would be preferred but this is not essential. Please apply by email and submit cv to mh@simulation.uk.com

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GasAlertMax XT – Simultaneous Monitoring

BW Technologies by Honeywell announces the arrival of the latest portable multi-gas solution – the compact, comfortable and field tough GasAlertMax XT.

Simultaneously monitoring for hydrogen sulfide (H₂S), carbon monoxide (CO), oxygen (O₂) and combustibles (%LEL), the GasAlertMax XT features an integrated sampling pump. Equipped with SmartSample technology, the GasAlertMax XT's powerful diaphragm pump saves time with reliable pump block detection; water and other liquids are prevented from being drawn into the pump. The simple, quick connect tubing system instantly secures the sampling hose in place, enabling the user to change tubing lengths and sampling accessories in seconds. With the pump filter window, users can quickly check the condition of the pump filter and replace it directly in the field.

By offering one-button operation, the GasAlertMax XT provides ease of use and simple compliance to industry safety standards. With the push of a button, the GasAlertMax XT starts up and begins a self-test, automatically verifying proper operation of visible, audible and vibrating alarms, sensors, battery and pump. Using the one-button interface, users are able to:

- Initiate calibration
- Acknowledge alarms and due dates
- View TWA, STEL and maximum (MAX) hold readings
- View the date and time
- Activate the backlight

Tamper-proof, user adjustable options enable the user to customize the instrument to suit specific applications. Eliminating push-button menu navigation, the GasAlertMax XT connects to a computer using the IR Connectivity Kit to access user-definable options:

- Display the detector's serial, firmware and hardware versions numbers
- Programmable start-up message
- Operational lockout in the event of a self-test error
- Safe mode
- Latching alarms
- Force calibration and force bump to ensure calibration and bump test days are adhered to
- Cal IR lock to force calibrations to be performed using the IR communications port and by authorized personnel
- Location logging
- Datalogging and confidence beep interval
- Multi-language interface in English, French, German, Spanish and Portuguese
- Individual sensor configuration
- Transfer data and upload firmware enhancements

Powered by a rechargeable battery pack that provides runtime for an entire 13 hour shift, the compact GasAlertMax XT comes with standard event logging and datalogging. Calibration is simple with an automatic procedure.



The GasAlertMax XT is ideally suited to a range of applications and customers including oil and gas, marine and shipping, utilities, wastewater treatment plants, power generation, municipal needs, and confined space entry. BW's confined space kits are designed to provide the user with all the accessories needed to safely and effectively monitor for potential atmospheric gas hazards. The GasAlertMax XT makes confined space entry quick and simple.

Customize your detector to suit specific applications and maximize performance with a wide variety of accessories. Cost-effectively manage the GasAlertMax XT with the MicroDock II docking system. Automatically test, calibrate, charge and manage data from single or multiple detectors. Fully portable and easily expandable, the MicroDock II requires no computer.

Charging is easy with a variety of single and multi-bay chargers for your office, worksite or vehicle. Free your hands and increase productivity by using the Holster to conveniently attach the detector to your belt and manage excess tubing. Gain additional protection in extreme environments with the Concussion-Proof Boots. A complete listing of GasAlertMax XT compatible accessories is available from your local BW Technologies Sales Representative.

APF

For more information, please contact:

BW Technologies by
Honeywell
2840-2 Avenue S.E.
Calgary
Alberta
Canada
T2A 7X9
Tel: 1-403-248-9226
Fax: 1-403-273-3708
Email:
info@gasmonitors.com
Website:
www.gasmonitors.com



By Jan Knappert
and Heinrich David

Alcohol Resistant Foam In Extremely Low Temperatures

Recent oil and gas discoveries have been found in the most inhospitable climates, where extremes of temperature are common, notably the Middle East where blackbody temperature can achieve +90°C and within the arctic circles of -40°C and lower.

These extremely low temperatures have given fire fighters severe difficulties in Fire Fighting Foam Concentrate selection when dealing with fuels containing alcohols and polar solvents.

Originally Alcohol Resistant Foams were developed using Polysaccharide Polymer Additive to form a stable blanket between the fuel and foam blanket, this minimises vapourisation of the fuel and minimises the alcohol absorbing the water in the foam bubble wall and causing it to break down and become ineffective.

In low temperature environments these Polysaccharide containing foams become extremely viscous because of their chemical composition (they are also known as Thixotropic or Non-Newtonian Liquids) and are then difficult to pump, at temperatures below -15°C, they will start to solidify and will be rendered unusable.

Ongoing product development between MSR Dosiertechnik GmbH and Dr Sthamer - Hamburg,

have developed not only a revolutionary low temperature foam for use at extremely low temperatures down to -25°C but also the means to proportion accurately at these extremely low temperatures.

FireDos is water driven foam proportioner, which does not require any external energy. Changing flow-rates, working pressures and viscosities of the dosing material have no influence of the admixing-rate.

The system consists mainly of a water motor and a piston pump. The foam concentrate is stocked in an atmospheric tank. The shaft of the water motor and the shaft of the piston pump are connected over a clutch. The whole water volume to the foam generators is passing the water motor. The number of rotations of the water motor are flow-proportional. The water motor is actuating a piston pump. The discharge volume of the piston pump is proportional to the number of rotation.

FireDos® GmbH

Admixing Systems for Fire-fighting

The intelligent choice for admixing systems

- No external energy required
- Working flow-proportional
- Easy installation and handling
- Retrofitting into existing systems possible
- Versions for stationary installations, or vehicles and mobile applications available, also for use with seawater
- Large flow ranges and dosing ranges covered
- Not affected by changing pressure or flow rate
- Suitable for all common fire-fighting liquids

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www.firedos.de

oam Proportioning emperatures



Any change of water flow changes without any delay the discharge volume of the piston pump, therefore the concentration remain constant.

The combination between water motor (positive displacement system) and piston pump (positive displacement system) create a accurate admixing rate, also in case of admixing rates of 1% or lower.

FireDos creates a pressure loss in the water system. The pressure loss is depending of the flow-rate, the working pressure and the admixing-rate. In case of a maximum flow-rate, a water pressure from around 10 bar and an admixing rate of 1% the pressure loss will be approx. 1 bar.

The system is able to admix all types of common fire fighting foam concentrates, also alcohol resistant foam concentrates and protein foams.

In combination with the right foam concentrate and foam generators low expansion, medium expansion and high expansion foams can be produced.

An excellent combination is **FireDos** and **Dr Sthamer – Hamburg Moussol APS LV 1x1** Alcohol resistant low viscosity foam concentrate with an admixing rate of 1%. Foam temperatures from minus 27°C and plus 25°C had no influences of the admixing rate. An ad-mixing rate 1.08% was achieved across the whole temperature range with different water flows and water pressures. Many installations have now been made with this combination of ad-mixer and foam concentrate.

FireDos is a compact admixing system and can be used for any fire fighting application, like fixed installations, in fire trucks, on ships, off shore in mobile applications. The water can be fresh water, brackish water or sea water. The systems are in flow-rates from 10 l/min and 20,000 l/min, with fixed, in steps changing or simultaneously changing admixing-rates from 0,1% up to 10%, working pressures from 16 bar, 25 bar and 40 bar and working temperatures up to 50°C and 80°C available.

The biggest advantage of **FireDos** is, that the system can be tested under real conditions foam to water without producing any premix solution.

An other possibility is the remote injection of the

foam concentrate. Between the system with foam tank and the injection point can be a distance up to 1,000 metres away.

With features like reducing of the minimum flow can the flow-range expanded up to 1:100.

FireDos has the VdS approval, the KFI (Korean Fire Institute), GL (Germanischer Lloyd, Marine approval), GOST-R approval (Russian Federation), approval from the Czech and Slovakian Republic. Applied for FM approval. The first batch of these units are in the FM laboratories for testing procedures.

IFP

PRODUCT NEWS MOUSSOL APS LV 1 × 1 Alcohol Resistant AFFF

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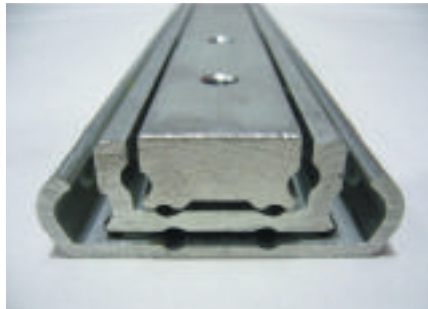
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Telephone +49 (0) 35 01-46 44 84 + 52 40 06
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GSF's 20.0007 Slide is Four Times as Good

GSF SLIDES, the leading UK drawer slide company that recently launched its product range in the USA at the FDIC 2008 show in Indianapolis, announces today that the mainstay of its slide range, its 20.0007 slide, is 4 times stronger than the standard type of heavy duty 500 lb class slide typically being specified currently onto many US fire truck drawer trays.

GSF (www.gsfsides.com & www.gsftilt.com) recently completed a



series of life cycle and load-drop tests on a range of its own products, which tests were intended to simulate some of the standard conditions that slides mounted on fire apparatus have to contend with.

The result of the test was that GSF's 20.0007 slide will operate comfortably with a 1,000lb load, including if the 1,000lb load is dropped onto the drawer.

By contrast GSF's equivalent of an industry standard 500lb cold-rolled drawer slide irretrievably broke when carrying its rated load of 500lb after only 27 cycles of a 5,000 cycle operational test. Disbelieving this result, GSF retested the slide at half the 500lb rating – with only a 250lb load; this time the slide failed after 576 cycles. Commenting, GSF's export director, Alec Don, said:

"If our 20.0007 carries 1000lbs, and our so called industry standard 500lb slide can not in fact even reliably carry 250lbs when subjected to typical fire truck conditions, I think we are entitled to say that our 20.0007 is at least 4 times as strong. Our cold-rolled slide, which we call our container slide, is superb for static situations such as electronic racks, furniture, or storage applications, but on an emergency or a defence vehicle something much more robust is needed.

Scott pioneer new lightweight Advanced Carrying System (ACS) for SCBA

Providing the wearer with greater comfort and total flexibility

Developed after considerable research and investment, SCOTT HEALTH & SAFETY announce the launch of the new innovative Advanced Carrying System (ACS), which is a great advancement in carrying systems combined with the highest standards of performance.

Reduced User Burden

Scott Health & Safety's new ACS is significantly lighter than any other carrying system in its class, with a unique lightweight ThermoFlex™ backplate offering the ultimate in comfort, ease of movement, flexibility and contributes to reducing wearer fatigue. The ergonomically sculptured, soft back plate is moulded to fit the spine and back muscles and was designed and developed following intensive research with osteopaths, fabric and industrial technologists. The ACS range is the only carrying system in the world to feature this new ThermoFlex™ technology.

The harness has fully adjustable padded shoulder straps and waistbelt, which is fitted with a quick release buckle. D Rings allow fast and easy connection of other equipment to the webbing or straps.

Lower Through Life Costs

The ACS harness is manufactured from highly durable materials, with corrosion resistant nickel plated components that are user serviceable, low cost and simple to maintain. Easy to keep clean, both the backplate and harness can be washed at the same time as turnout gear, and



the new hardwearing fabric material used in manufacturing is approved to maintain its flame retardant qualities for 50 washes at 90°C. A washing bag can be included to protect the harness and washing machine.

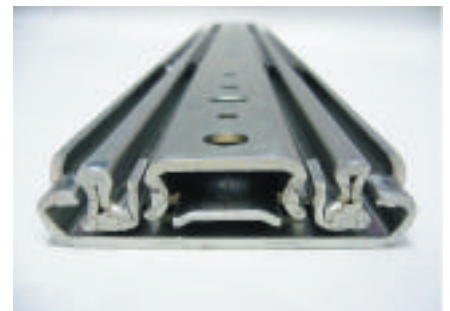
High performance pneumatics

At the heart of the ACS is a simple, high performance and reliable two-stage pneumatic system.

No tools are necessary to remove the pneumatics as this can be achieved by simply rotating the pneumatics 90 degrees to disengage from the mounting.

There are different sets available for oil and gas, marine, industrial and fire environments. The design and manufacture of the backplate enables bespoke tailored sets to be made in a variety of colours and corporate branding to meet individual requirements. All sets are approved to EN, MED, AS standards and there is wide choice of cylinders and face masks including Vision 3 and Promask PP ranges.

Full detail of the new Advanced Carrying System (ACS) is available from Scott Health & Safety or comprehensive information can be found at www.scottsafety.com



Our 1,000lb 20.0007 slide is fabricated from cold-drawn steel bar, of itself much stronger against shock and vibration, but it is not just a question of the steel – it's also a question of the strength of the end stops and the cage and the use of a reinforcing sets of minor-axis bearings, which altogether makes this the slide of choice for emergency vehicles throughout the world.

For fire trucks "cheap" is dangerous.

For more information, please contact:

GSF Slides

Tel: +44 1691 770303

Email: info@gsfsides.com

Website: www.gsfsides.com

Battery operated backpack power units (12V dc)

– for the use of cutters, spreaders and cylinders

SP700 backpack power unit is essential in the case of car, train or plane accidents, where these extreme situations require prompt intervention assuring the maximum of safety and mobility.

The unit is powered by a DC motor with a high power 12V battery, suitable to be helicoptered and used also in presence of fuels or inflammables, owing to its non-sparking features. SP700 can be connected to all rescue tools on the market (cutters, spreaders and cylinders etc) working at 350, 630 and 720 bar (5100, 9200, 10500 psi). The battery run-down time is over 30 minutes, and it is easy and fast to replace it with a spare battery. Once worn by the operator (it only weighs 18 kg), it is very similar in shape and overall dimensions to SCUBA gear and it can be used where traditional gasoline engine power units cannot be brought or used (such as confined and/or poorly ventilated space) and in case of car, train or plane accidents where a high concentration of crash debris caused by the accident do not let the operator get to the rescue sites with traditional units. During the intervention, the operator equipped with SP700 backpack power unit maintains agility and efficient handling which make rescue operations fast and direct, allowing the operator to keep the whole situation under control including accident victims, who will also be spared the additional trauma caused by noise and exhaust fumes created by the old style gasoline driven power units. The total absence of these problems permits operation of SP700 group even in presence of gas and or other inflammables such as fuel.

Maximum practical use is achieved by using our VP700 unit. VP700 back pack power unit has the same features and the same use than SP700 model.

The only difference is the external suitcase container, which is extremely sturdy and watertight until 2 mt. depth.

It is provided of slings in order to be worn by the operator and of slings which let the unit be fastened to the helicopter winch.

Because of its sturdiness and its portability, it is indicated for heavy duties, sea rescue, mountain and tunnels.

We do have further reasons to recommend the use of our back pack power units:

- 1** totally silent
- 2** No polluting (totally absence of exhaust fumes)
- 3** safe (12V tension)



- 4** few seconds to activate it, in any weather condition
- 5** versatile, it can be connected to all tools in the market
- 6** adjustable working pressure between 630 to 720 bar
- 7** no long hoses or electric cables
- 8** compact, ergonomic, back pack
- 9** light and practical when used in confined spaces
- 10** unlimited range
- 11** unlimited rescue time by battery replacement
- 12** free hands transport in order to climb stairs, ladders or to go past obstacles
- 13** quick passage in case of mass accident from one vehicle to another
- 14** equivalent power of traditional power engine units
- 15** it can be helicoptered
- 16** waterproof until 1 meter depth (VP700 version only)

However, we think these are not all the advantages of these units, because only professionals like you will be able to discover other features during their use. **APF**

Website : www.interfron-hydraulicrescue.com

INTERFRON SpA



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Fire India 20



Following its successful launch in 2007, IFSEC India 2008 will take place from 16-18 October 2008 at Pragati Maidan, New Delhi, India. The event is South Asia's leading security exhibition, and this year, will see the launch of Firex India 2008, extending the reach of the already hugely popular International Firex brand in the UK. IFSEC India is part of IFSEC, the world's leading security and fire exhibition held annually for the past 36 years in Birmingham, attracting more than 32,000 attendees every year.

Together the shows recognise the rapid expansion of the fire and security industries in India, which are growing by around 47% per year, according to research published by the BSIA last year. The decision to launch Firex India follows months of extensive investigation and discussion with the industry.

Simon Parker, Group Director at CMP Information comments, "Rapid market growth and the corresponding increase in production activity make India a logical focus for our continuing global expansion of the fire and security event family. The overall fire protection market in India is worth almost US\$339mn, making it a huge area of interest for local and international manufacturers and distributors."

Mr M. Gandhi, Managing Director at CMP Asia comments, "IFSEC India and Firex India will be the ideal place for end-users from the IT, ITes, retail, hospitality, residential, industrial plant and health sectors to keep up-to-date with the latest innovations and developments in the fire and security industries across the South Asian region."

One of India's foremost trade associations, The Fire and Safety Association of India (FSAI) has



08 Preview



offered its support for the event for the second year running.

"The management of FSAI and its members are excited about being associated with Firex India 2008 and IFSEC India 2008, which are considered to be premium events in the fire and security sectors. Combined with the strengths of the events and the growth of the FSAI, we will be able to add great value to the Indian fire safety and security industry by sharing knowledge with world leaders from across the globe," comments Arun Khazanchi, President, FSAI.

The exhibitions will feature over 200 of the world's leading security and fire manufacturers and distributors, and over 100 hours of educational content, including high level conferences led by experts in their fields. Entitled "Crossing the Rubicon," the IFSEC India Conference will cover the hottest topics in both the fire and security markets in India. Topics covered will include internal security, IT security, intelligent buildings, fire safety codes and standards and suppression solutions.

"The security market in India is growing at a tremendous rate and there is a continuous demand for high standard security across industries and the Government. IFSEC India 2008 is an exceptional platform that gives an opportunity to security solution companies to showcase various

products. The response and reach that we as an exhibitor get here, is impressive, extremely client centric and productive. We are proud to be a part of IFSEC India 2008 and are excited about showcasing our 'next level' of innovations at the exhibition, which we are certain will exceed our expectations," says David Hudson MBE, Regional President, Group 4 Securicor Pvt Ltd.

Deepak Thakur, Director South Asia, Honeywell Security comments, "Honeywell will continue to showcase new products and solutions, equipped with state of the art technologies through events such as IFSEC India 2008. This event has been a successful platform for Honeywell to exhibit our domain expertise to our customers across various verticals, year-on-year. We are pleased with our association with such an esteemed exhibition in India."

IFSEC India 2008 and Firex India 2008 will take place from 16-18 October 2008 at Pragati Maidan, New Delhi, India. For more information and to register for free entry, please visit www.ifsecindia.com. Companies interested in exhibiting at the event should contact Anindya Sarangi on +91 22 66122644 or anindyas@ubmindia.com, or Charlie Cracknell on +44 (0) 207 921 8069 or ccracknell@cmpi.biz. **APF**



IFSECINDIA

16-18 October 2008
Pragati Maidan New Delhi

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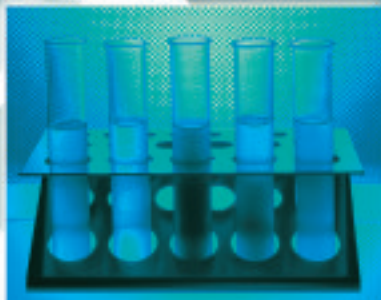


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catering for professionals specialising
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Zero Ozone Depleting Potential (ODP)

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The Chemetron mission is simple – when it comes to fire protection there can be no compromise.

Contact us today to learn more about Chemetron system solutions!

Our products meet or exceed NFPA and Selected Global Standards, as well as being UL Listed and FM Approved.

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A UTC Fire & Security Company

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The Fire-Safe Cleanroom Journey Continues

We're almost there...

By Vincent
DeGiorgio

FM Global

During the past 30 years, the semiconductor industry has experienced exponential growth, which has significantly affected our daily lives. This growth, however, has come at the expense of semiconductor process-related fires that have caused devastating property damage, production interruption and loss of market share.

Following the two large fires in Taiwan in 1996 and 1997, FM Global and other fire protection professionals stepped back and questioned "How can we improve fire safety and change the industry's track record?"

Ten years later – with the collective efforts of many organizations and individual contributions – the journey toward the fire-safe cleanroom is almost complete.

Factors that have led to this tremendous improvement include the following:

- Widespread use of non-fire propagating construction materials
- Safe process liquid heating systems
- Third-party assessment of process equipment prior to installation
- Improved handling and disposal of silane gas
- Adherence to improved codes and standards

Current state

Released in 1997 by FM Approvals, a Nationally Recognized Testing Laboratory (NRTL), the Cleanroom Materials Flammability Test Protocol (Class 4910) has become the industry standard for the evaluation of construction materials used in cleanrooms.

FM4910 measures two crucial fire-related elements of a product or material:

- The Fire Propagation Index (FPI), an indicator of the tendency of a material to ignite and propagate fire, and
- The Smoke Damage Index (SDI), an indicator of the amount of smoke generated

For material to be considered non-fire propagating under FM4910, its FPI must be equal to or less than 6.0 and its SDI equal to or less than 0.4. Materials that meet the "Cleanroom Materials Flammability Test Protocol" do not require, in and of themselves, fixed fire protection when used according to the appropriate FM Global data

sheets. Material listed under FM4910 may burn locally in the ignition area, but will not propagate a fire beyond the ignition zone. Additionally, such materials produce little, if any, smoke or corrosive byproducts, this minimizing non-thermal damage.

Today, there are 17 manufacturers producing nearly 150 different types of FM4910-listed materials. A complete listing of FM4910 materials can be found at <http://www.fmglobal.com/assets/pdf/4910Approved.doc>.

This ever-expanding list has led semiconductor tool vendors to build the majority of products (i.e., wet benches, etc.) out of FM4910 materials. In fact, for some tool vendors, FM4910 material-constructed tools have become the standard of choice. Tools made with less expensive (but highly combustible) polypropylene or polyvinyl chloride are, in many cases, now available only by special order.

While FM4910 materials are prevalent in semiconductor cleanrooms, they can easily be applied in other industries that utilize cleanrooms (i.e., pharmaceutical, biotech, food processing, etc.). Although FM4910 fire-safe materials are helping prevent cleanroom fires, they cannot do it alone.

In the past, the typical fire scenario was a high-energy process liquid immersion heater or a hot plate igniting combustible plastic associated with wet bench. Once ignited, the fire was drawn into the process exhaust ductwork, which many times was constructed of combustible plastic. Once the ductwork was ignited, the fire would spread inside the ductwork all the way to the scrubber.

Companies have eliminated the exposure created by combustible process exhaust ductwork by installing ductwork which meets FM Approvals Standard for Fume Exhaust Ducts or Fume and Smoke Exhaust Ducts (Class 4922). Even when subjected to a severe fire, FM4922-Approved ductwork will:

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Organization	Code/Standard	Comments
FM Global	Data Sheet 7-7 "Semiconductor Fabrication Facilities" <i>2003 Edition</i>	Addresses semiconductor device fabrication and associated hazards from a property loss prevention and business continuity perspective. <i>Currently under revision.</i>
FM Approvals	FM 4910 "Test Standard for FM Approvals Cleanroom Materials Flammability Test Protocol" <i>September 1997</i>	This test standard describes minimum performance requirements for materials which are intended for use in cleanroom facilities.
FM Approvals	FM4911 "Approval Standards for Wafer Carriers for Use in Cleanrooms" <i>August 2006</i>	This test standard sets performance requirements for wafer carriers used in cleanrooms by evaluating the ability of these products to limit fire spread and smoke damage.
FM Approvals	FM4922 "Approval Standard for Fume Exhaust Ducts or Fume & Smoke Exhaust Ducts" <i>April 2001</i>	This test standard sets performance requirements for ducts installed according to limitations and requirements specified for each individually manufactured duct system.
FM Approvals	FM7701 "Assessment Standard for Tools Used in the Semiconductor Industry" <i>December 2005</i>	This standard is used for assessing manufacturing equipment (tools) used by the semiconductor industry as it relates to property conservation and business continuity.
National Fire Protection Association (NFPA)	NFPA 318 "Standard for the Protection of Semiconductor Fabrication Facilities" <i>2006 Edition</i>	Provides reasonable safeguards (protection against injury, loss of life and property damage) for the protection of facilities containing cleanrooms from fire and related hazards. <i>2008 Edition will be voted upon during the June 2008 World Safety Conference.</i>
Semiconductor Equipment Materials International (SEMI)	S2-0706b "Environmental, Health, and Safety Guideline for Semiconductor Manufacturing Equipment" <i>July 2006</i>	This safety guideline is intended as a set of performance-based environmental, health, and safety (EHS) considerations for semiconductor manufacturing equipment.
Semiconductor Equipment Materials International (SEMI)	S3-0360 "Safety Guideline for Process Liquid Heating Systems" <i>March 2006</i>	Complete rewrite in 2006. Provides minimum general safety considerations for the design and documentation of heating systems used for the changing or maintaining the temperatures of process liquids used in the semiconductor and flat panel display manufacturing.
Semiconductor Equipment Materials International (SEMI)	S14-0704 "Safety Guidelines for Fire Risk Assessment and Mitigation for Semiconductor Manufacturing Equipment" <i>July 2004</i>	Provides consideration to the manufacturers of semiconductor manufacturing equipment that will assist them in assessing and mitigating the risk to equipment and product associated with fire and combustion by-products.
International Code Council (ICC)	International Fire Code <i>2006 Edition</i>	This code establishes regulation affecting or relating to structures, processes, premises and safeguards. Chapter 18 addresses Semiconductor Fabrication Facilities. <i>Currently under revision.</i>
Compressed Gas Association (CGA)	G-13 "Storage and Handling of Silane and Silane Mixtures" <i>Second edition 2006</i>	Addresses installation of systems and sources used to store, transfer or contain silane or silane mixtures. <i>Currently under revision.</i>

- Not collapse
- Not propagate fire, and
- Will release only minimal amounts of smoke

Increasingly, new and retrofitted cleanrooms are installing FM4922-Approved ductwork. However, a considerable amount of combustible ductwork with no automatic sprinkler protection still remains in some facilities. Installing either FM4922 products or proper sprinkler protection in these cleanrooms is highly recommended.

Replacing combustible ductwork with FM4922-

Approved ductwork in existing operating cleanrooms is not as daunting a challenge as it may appear. In fact, a major semiconductor manufacturer has successfully completed such a replacement. To that company, the benefits substantially outweigh the potentially astronomical loss potential.

Codes/Standards

As mentioned above, adherence to improved codes and standards as shown in the table has

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Company	Product	Description
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Solvay Solexis www.solvaysolexis.com	Galden® HT and H-Galden® ZT Fomblin	FM 6930 Approved Industrial Fluid. Heat transfer fluids for use in semiconductor equipment.
Mitsubishi Chemical Functional Products, Inc. www.alpolic-usa.com	Alpolic®/fr Panel	FM4910 Listed Material. Exterior and interior wall panels.

been a significant contributor in improving cleanroom fire safety:

Many of these codes/standards recommend the use of fire-safe construction materials for cleanroom applications. In cases where such materials are not used, fixed fire detection and suppression systems are the recommended alternative. If neither measure is taken, the results can be catastrophic.

In 2005 FM Approvals issued an assessment standard for Tools Used in the Semiconductor Industry (Class 7701). This assessment standard evaluates the following aspects of semiconductor manufacturing equipment (tools):

- Chemical
- Control and/or safety interlocks
- Electrical
- Fire
- Materials
- Ventilation

Currently, before new tools are installed, they often require on-site evaluation (either at the manufacturer or client's facility) by a semiconductor specialist on a case-by-case basis. Due to the complexity and diversity of semiconductor manufacturing equipment, this can be a time-consuming and potentially costly endeavor.

When a tool is evaluated under FM7701, it will only require a spot check after installation, saving tool vendors and semiconductor manufacturing companies significant amounts of time and money. And, having fire-safe semiconductor equipment is critical in the event of a fire. Consider the fire damage consequences cited at the outset of this article.

A major semiconductor equipment manufacturer has recently completed the FM7701 assessment and will shortly become the first company to receive formal FM7701 recognition.

Silane gas usage

Silane, more so than other gases used in semiconductor manufacturing, can lead to severe exposures. It is a stable gas but is pyrophoric, that is, under certain conditions, it can spontaneously ignite or have delayed ignition, which could lead to an explosion.

Silane has been involved in a considerable number of fires. Common scenarios included untreated silane released into combustible fume exhaust ductwork and improper cylinder change out procedures resulting in leaks at the cylinder

connection points.

During the past couple of years, there have been several unfortunate events, which have led to a renewed interest in the safe handling of silane. During the past two years, Air Products and Chemicals, Inc. organized a series of Silane Safety Seminars held in Taiwan, Korea, China and Singapore, and most recently in Portland, Ore. The goal of these highly successful seminars was to educate the audience with respect to silane behavior and best protection practices.

Open issues

One significant cleanroom fire hazard still needs to be addressed: containers used to store in-process wafers.

Wafer carriers or pods (200mm wafers) and Front Opening Unified Pods, or FOUPs (300mm wafers), are currently made of highly combustible materials like polycarbonate and polypropylene. These pods or FOUPs are typically placed inside vertical storage systems known as stocker. And fire, *burns* for highly combustible materials placed in a vertical array.

FM Approvals issued the Approval Standard for Wafer Carriers for use in Cleanrooms (Class 4911). This standard provides testing criteria similar to FM4910 in order for a fire-safe wafer carrier to earn FM Approval.

A supplier of wafer carriers and FOUPs is presently working with FM Approvals to develop a FOUP which will meet the requirements of FM4911 as well as the strict process requirements.

New fire safety products

The table above is products that have recently received FM Approvals certification and can improve overall cleanroom fire safety.

Future outlook

The outlook for further progress in cleanroom protection is very promising. The use of FM4910 materials and FM4922 ductwork is well established. Current codes/standards support the use of fire-safe materials. Attention needs to be focused toward bringing a FM4911 Approved wafer carrier/FOUP to market. Recently released new products have provided a solution to areas previously lacking fire-safe alternatives. Products under development, which will add to cleanroom fire safety, include wall panels and wires/cables.

APF

Vinnie DeGiorgio is FM Global's principal engineer for the semiconductor industry. DeGiorgio has more than 26 years of property loss control and business impact risk assessment experience associated with the semiconductor and related high technology industries. DeGiorgio holds a bachelor's degree in engineering and a master's degree in fire protection engineering. He maintains memberships with the National Fire Protection Agency (NFPA) and Society of Fire Protection Engineers, (SFPE), is a board member of Semiconductor Environmental Safety & Health Association (SESHA) and is the secretary of the NFPA 318 Technical Committee on cleanrooms. Of note, DeGiorgio has expansive knowledge of the semiconductor industry in Asia.

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Planning The Great Escape:

Emergency Evacuation Planning

By Bianca Frost

WinterComms
Communications Officer

Nobody expects an emergency or disaster – especially one that affects them, their employees, and their business personally. Yet the simple truth is that emergencies and disasters can strike anyone, anytime, and anywhere.

You and your employees could be forced to evacuate your company when you least expect it. The best way to protect yourself, your workers, and your business is to expect the unexpected and develop a well thought-out emergency action plan to guide you when immediate action is necessary.

A workplace emergency is an unforeseen situation that threatens your employees, customers, or the public; disrupts or shuts down your operations; or causes physical or environmental damage. Emergencies may be natural or manmade and

include anything from flood, fires and cyclones to chemical spills, explosions, civil disturbances and terrorist threats.

Unequivocally, the best way to respond to an emergency is to prepare for it before it happens. Few people can think clearly and logically in a crisis, so it is important to do so in advance, when you have time to be thorough. Brainstorm the worst-case scenarios. Ask yourself what you would do if the worst happened. What if a fire broke out in your boiler room? Or a cyclone hit your building head-on? Or a train carrying hazardous waste



Graeme Badrock,
Emergency Planning
Manager at Essential
Property Services

derailed while passing your loading dock?

According to Graeme Badrock, Emergency Planning Manager at Essential Property Services, the best way to protect yourself, your employees and your business in a workplace emergency is to have a range of processes and procedures documented against consistent guidelines that everyone in your organization can work to.

"Documentation relates to an organisation's policies regarding any particular emergency. Just as organisations have policies on what happens when a new person starts and how they are inducted into that organisation, good emergency management planning should follow a similar model," says Badrock.

An effective emergency evacuation plan should cover all potential emergency scenarios and then consider them in relation to the specifics of the facility in question. Floor plans, hours of occupancy, hazardous materials and the type of emergency-related equipment and systems installed in the building will all have a defining impact on the final emergency plan.

The plan should cover all the designated actions employers and employees must take to ensure employee safety from fire and other emergencies. And integral to this, Badrock stresses, is the importance of having adequate numbers of staff trained to ensure the implementation, management and completion of these actions.

"Some facilities are occupied 24 hours a day, seven days a week, but their staffing levels will vary. For example, between eight a.m. and six p.m.

there is likely to be a higher volume of staff and visitors coming and going, while after that, depending on the type of facility, the numbers generally drop, so the number of staff available to fulfill emergency duties will vary throughout the operating hours of the facility.

"The same applies for weekdays versus weekends and public holidays. The effectiveness of the emergency evacuation plan is really dependent on the number of trained staff available to facilitate roles in an emergency," he said.

"It is critical in the first instance, that a sufficient number of staff are allocated to coordinate and implement the emergency plan. If there are not, facility management might have a well documented procedures plan that fails, due to lack of suitable trained personnel on site at any given time to execute it effectively".

An effective emergency evacuation plan should cover all potential emergency scenarios and then consider them in relation to the specifics of the facility in question.

Furthermore, Badrock says that comprehensive staff training is also imperative for any effective workplace evacuation.

"It is essential that the core group of staff who are charged with the responsibility of coordinating the emergency evacuation plan are actually trained in those processes and are comfortable with their allocated roles. While people always have good intentions and will attempt to carry out what they think is appropriate at the time of an emergency, without the proper training prior to the emergency, situations can quickly get out of control," says Badrock.

"Untrained individuals may endanger themselves and those they are trying to rescue. For this reason, it is generally wise to leave rescue work to those who are trained, equipped, and certified to conduct rescues."

Metropolitan Fire Brigade Commander, Community Safety, Dave Davies agrees.

"The most common mistake made by organisations in terms of emergency planning is a lack of understanding and training. Organisations forget that they are empowering the chief warden with an extremely important function, so those people need to be properly informed and supported," he says.

When attending an emergency, Davies says that, from a firefighter's perspective, the most important information to know is firstly that everyone is out of the building, secondly, where those people are, and thirdly, what the situation is regarding their welfare.

"Most of the time when we attend an emergency call, people will say that they've got all the people out but when we ask how many people they've actually got they don't know. When we ask where are your people, they don't know that

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either. We'll then ask them how sure they are that they've got everybody out and they'll reply, well, we think we've got them all out".

"The firefighter has then got to start the emergency evacuation process all over again and check the entire building or area that's involved with the emergency to make sure that there are no escapes to be performed."

Davies says that it's the responsibility of the organisation to provide for the welfare of their people in a crisis and adequate training of staff allocated to warden roles is the only way to provide this. The consequence of failing to properly train staff is that while the fire brigade is expending its full forces – possibly needlessly – to ensure the building has been fully evacuated, they are not able to take any action to address whatever the crisis is.

"In other words," says Davies, "it takes us a longer time to control the situation. Organisations need to realise that is their responsibility to develop an emergency management plan that addresses the best way to not only to evacuate people outside to an evacuation control point, but to account for the number of people to be evacuated at any given time."

When drafting your emergency action plan, select a responsible individual to lead and coordinate your emergency plan and evacuation.

To ensure the fastest, most accurate accountability of your employees, Davies recommends that facility managers consider the following in developing their emergency evacuation plan:

- Designate assembly areas where employees should gather after evacuating;
- Take a head count after the evacuation. Identify the names and last known locations of anyone not accounted for and pass them to the official in charge
- Establish a method for accounting for non-employees such as visitors and contractors
- Establish procedures for further evacuation in case the incident expands.

When drafting your emergency action plan, select a responsible individual to lead and coordinate your emergency plan and evacuation. This person should be responsible for assessing the

situation to determine whether an emergency requiring the activation of emergency procedures exists; supervising all efforts in the area including evacuating personnel; coordination of outside emergency services such as medical aid and local fire departments and ensuring that they are available and notified when necessary; and directing the shutdown of plant operations if and when required.

It is critical that all employees know who the Chief Warden is and understand that the person has the authority to make decisions during emergencies. In addition to a Chief Warden, you may need to designate evacuation wardens to help move employees from danger to safe areas during an emergency. Generally, one warden for every 20 employees should be adequate, and the appropriate number of wardens should be available at all times during working hours.

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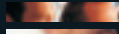
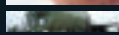
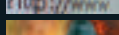
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Employees designated to assist in emergency evacuation procedures should be trained in the complete workplace layout and various alternative escape routes. All employees and those designated to assist in emergencies should be made aware of employees with special needs who may require extra assistance, how to use a buddy system, and hazardous areas to avoid during an emergency evacuation.

In support of this advice, Badrock says that the senior person in charge (the Chief Warden), is only as good as the people supporting them in their work environments.

"Their ability to coordinate an emergency will really be dependant on the quality of information supplied to them by zone or area wardens, who will need to assess the situation at the coal face and report back if they need assistance or additional resources," he says.

"Organisations need to be diligent in the way they go about training staff and about making sure they have adequate numbers of relief or back-up staff trained to step-up and fill the role if required. It's not enough to just have one member of staff trained in one area. If someone is away, or they have meetings off premise and they don't have a backup when an emergency unfolds, then suddenly we have gaps in the processes because

has an obligation to ensure that the building's safety features have not been compromised by interior building works that they might do in terms of making the fit-out appropriate for their activities," says Badrock.

"The two parties need to embrace the idea set out in the Australian standard; namely that they need to create a safe environment for the occupiers, ensuring that they have an emergency planning committee established for that building."

An emergency planning committee is usually formed from representatives of the building's owner and its occupiers who meet to discuss and formulate a plan for responding to an emergency situation.

Badrock is careful to point out that facility managers should not be the only party driving emergency evacuation planning and management. Under occupational health and safety legislation, employers are responsible for developing an overall policy for employee safety which includes emergency planning procedures.

"It's a matter of all parties working together," says Badrock. "If the building is only occupied by a small number of tenants then it's usually a lot easier to get them together, discuss how to handle various emergency processes and agree to a plan."

"At the other end of the scale, the difficulty

All employees and those designated to assist in emergencies should be made aware of employees with special needs who may require extra assistance, how to use a buddy system, and hazardous areas to avoid during an emergency evacuation.

the zones or areas aren't under the control of a warden. It's these gaps which can cause serious headaches in an emergency situation," Badrock explains.

Badrock suggests keeping training records and matching those against other data such as shift rosters and the commencements and terminations of employees as part of an organisation's normal staff turnover. He also recommends a register for external contractors working on premise.

"Depending on the type of facility in question, some organisations have sign-in registers where people who are not normally on site are expected to sign in and be issued with passes. In this way, their presence is accounted for, and someone can take responsibility for their presence within the facility," he says.

When a building is occupied by more than one tenant, there are additional issues to address. While the building's owner is required to meet their building and safety compliance obligations, it is also incumbent upon the building's tenants to participate in the planning and implementation of emergency management processes. This should be done through the formation of an Emergency Planning Committee.

"The occupier, who may in the course of their tenancy make some adjustments to the floor plan,

some facility managers face is that their building is occupied by a large number of tenants and requires a large number of staff to fulfill certain roles.

"In this instance, it's really a case of all parties working collaboratively to develop procedures in the event of an emergency occurring. A lot of those processes might be driven by the larger tenants or stakeholders, but all parties need to be engaged and be actively involved in developing and maintaining emergency procedures.

"While all parties might express good intentions on how they propose to manage an emergency it can often be the case that they didn't have sufficient back-ups appointed and very quickly problems can cascade because the guidelines that were put in place have not been followed. A coordinated approach is therefore paramount to an effective emergency evacuation," says Badrock.

"What we don't want are individual tenants looking at their environment in isolation," he says. "This is a recipe for disaster in an emergency situation. For example, in a multi-story building you are potentially dealing with a large number of staff or occupants, so one of the potential problems is that if you need to evacuate, you would have to assess whether it is necessary to evacuate the whole building or, if a problem is on a specific

floor, it might just be a matter of evacuating that floor and the floors immediately above and below the affected floor.

"In terms of a full evacuation, again, one would need to look at the floor plan to determine whether a staged or simultaneous evacuation should be carried out. If there are multiple exit points, then it may be possible to evacuate all occupants at once. If not, then a more controlled evacuation is likely to be required."

Putting together a comprehensive emergency evacuation plan that deals with all types of issues specific to your worksite is not difficult. At a minimum, your plan should include an evacuation policy and procedure; emergency escape procedures and route assignments, such as floor plans, workplace maps, and safe or refuge areas; a preferred method for reporting fires and other emergencies; the names, titles, departments, and telephone numbers of individuals both within and outside your company to contact for additional information or explanation of duties and responsibilities under the emergency plan; clearly defined procedures for employees who remain on site to perform or shut down critical plant operations, operate fire extinguishers, or perform other essential services that cannot be shut down for every emergency alarm before evacuating; and rescue and medical duties for any workers designated to perform them.

In addition, you may find it helpful to include in your plan the site of an alternative communications centre to be used in the event of a fire or explosion and a secure on or offsite location to

store originals or duplicate copies of accounting records, legal documents, your employees' emergency contact lists, and other essential records.

A disorganised evacuation can result in confusion, injury, and property damage. That is why when developing your emergency action plan it is important to be absolutely clear about the conditions under which an evacuation would be necessary and have a clear chain of command and designation of the person in your business authorised to order an evacuation or shutdown.

All staff should be clear about specific evacuation procedures, including routes and exits, and these should be posted where they are easily accessible to all employees. Finally, there should be a system in place for accounting for personnel following an evacuation.

The best emergency action plans include employees in the planning process, specify what employees should do during an emergency, and ensure that employees receive proper training for emergencies. When you include your employees in your planning, encourage them to offer suggestions about potential hazards, worst-case scenarios, and proper emergency responses.

Educate your employees about the types of emergencies that may occur and train them in the proper course of action. The size of your workplace and workforce, processes used, materials handled, and the availability of onsite or outside resources will determine your training requirements. Be sure all your employees understand the function and elements of your emergency action

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entry, or anywhere combustion exhaust poses a hazard. Its quiet operation allows for a more controlled rescue scene. The VP700 backpack power unit is identical in weight and function to the SP700. The sturdy outer case allows for operations in the most unforgiving environments, making it perfectly suited to confined space, and other high hazard areas. The straps provided are robust enough to allow the unit to be lowered by helicopter into an emergency scene. Watertight until 2 mt. depth.

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plan, including types of potential emergencies, reporting procedures, alarm systems, evacuation plans, and shutdown procedures. Discuss any special hazards you may have onsite such as flammable materials, toxic chemicals, radioactive sources, or water-reactive substances. Clearly communicate to your employees who will be in charge during an emergency to minimise confusion.

General training for your employees should address their individual roles and responsibilities; potential threats, hazards, and protective actions; notification, warning, and communications procedures; the best means for locating people in an emergency; evacuation, shelter, and accountability procedures; the location and use of common emergency equipment; and, where applicable, emergency shutdown procedures.

You also may wish to train your employees in first-aid procedures, including protection against blood-borne pathogens; respiratory protection, including use of an escape-only respirator; and methods for preventing unauthorised access to the site.

Once you have reviewed your emergency action plan with your employees and everyone has had the proper training, it is a good idea to hold practice drills as often as necessary to keep employees prepared.

they really need to plan for all of them."

After each drill, Metropolitan Fire Brigade Commander, Davies recommends gathering management and employees to evaluate the effectiveness of the drill by identifying the strengths and weaknesses of the plan. Drilling should also be considered when an organisation hires new employees, introduces new equipment, materials, or processes into the workplace that effect evacuation routes, changes the layout or design of the facility or updates any emergency procedure.

"It's imperative that the staff in the building take ownership of its emergency evacuation procedures and understand all the emergency management arrangements that have been put in place," he says.

"Organisations need to set up an infrastructure and management structure that will make that system work and ensure that the warden structure is fully supported and that wardens understand the importance of their role and the function they play in that plan.

"Trialling your plan is essential. You should be looking at any mistakes or shortfalls as you go and then building solutions to those problems back into your documentation. This is the best way to assist people in not making the same mistakes a second time.

General training for your employees should address their individual roles and responsibilities; potential threats, hazards, and protective actions; notification, warning, and communications procedures; the best means for locating people in an emergency; evacuation.

"The Australian standard talks about conducting drills or exercises to ensure procedures are satisfactory and all staff are comfortable and proficient in their roles should an emergency occur. Some organisations only conduct a drill or exercise annually, but if they were true to the purpose of what they are trying to achieve, they really need to be conducted at a frequency that ensures all areas of a facility and its occupants participate in at least one exercise in each 12 month period," says Badrock.

Badrock is a firm believer in perfected practice through drilling.

"You can have well documented policies and procedures, and well attended staff training sessions, but it is not until your organisation conducts drills or exercises that you have the opportunity to test your preparedness for an emergency and see how workable your procedures are."

Badrock believes that organisations should also practice drills for different kinds of emergency scenarios.

"The type and frequency of drills are really dictated by the initial risk assessment conducted for the facility and the types of emergencies that might be encountered. A lot of people think that if they plan for a fire, then that covers their emergency plan needs. But there are a range of emergencies that an organisation could be confronted with and

While Davies has seen many mistakes made by organisations in terms of their emergency evacuation planning, he has also seen more and more organisations mature in their attitude to emergency management.

"A lot of organisations now regard emergency management as part of a business continuity strategy," he said.

"A business continuity plan not only provides for the prevention of incidents by conducting risk assessments, and provides for emergency management response plans, but it also covers the recovery phase. In other words, the recovery of the business after an emergency, which focuses on getting the business back on track as quickly as possible." Collectively these plans form part of a comprehensive risk management strategy, since risk management by definition is the mitigation of anything that might impact on an organisation's ability to function in the pursuit of its objectives.

And having a well structured, fully understood, and well supported and practiced emergency evacuation plan is an integral component of any risk management strategy.

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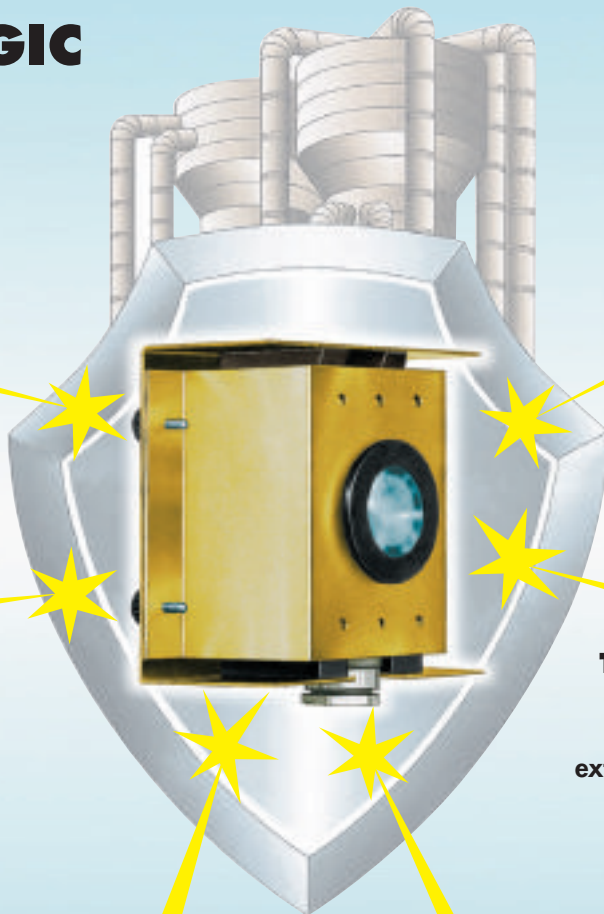
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Selecting and Placing Gas Detectors for Maximum Application Protection

By Dave Opheim

Detector Electronics Corporation

Many industrial processes involve dangerous gases and vapors: flammable, toxic, or both. With the different sensing technologies available, and the wide range of industrial applications that exist, selecting the best sensor and locating them properly for the job at hand can be a challenge.

To ensure a high level of safety, know the latest sensing technologies, which technology is best for the application, and where detectors should be installed for maximum protection.

General Introduction to fixed gas detection

Portable gas detectors are small, lightweight, and move with the user; many are disposable. Fixed gas detection systems, on the other hand, are designed for installation at a stationary location and are expected to provide long-term service life and protection. This article addresses fixed gas detection only. Three main types are generally offered: point-type, open-path, and analytic or sampling detection systems.

Point-type gas detectors

Point-type gas detectors can be fitted with either combustible or toxic gas sensors. These detectors monitor a specific area or point within the facility and must be strategically located for early detection of gas. These detectors require calibration for the gas type to be detected. Point-type detectors also must be routinely inspected to ensure they are capable of performing as expected.

Open-path or line-of-sight gas detectors

Open-path, or line-of-sight, gas detectors monitor the presence of combustible hydrocarbon gases within a beam of infrared light projected between a pair of modules. To ensure that the gas/vapor hazard passes through the light beam, the modules must be strategically located and properly aligned.



Point gas detectors detect gas in the air within a defined radius of their sensor



A pair of open-path gas detectors detect gas in the air between the two sensors

As with point-type detectors, open-path detectors must be calibrated for the gas type to be detected. Typically, open-path detectors are self-monitoring in the case of a blocked light beam or similar trouble.

Analytic/sampling gas detection systems

Many point-detection and analytical instruments use a sampling system technique to extract an air sample, direct the sample to a sealed sensor where it is analyzed, and then exhaust or return the sample to a safe location. Sampling system components typically include a vacuum pump, sensor(s), flowmeters, filters, and flow control elements. They are generally mounted on a subplate installed within an enclosure with compression fittings for sample tubing connections.

Gas Alarm Threshold Settings

Fixed gas detection systems provide alarm output signals to alert people and initiate corrective action. The alarm settings must be low enough to ensure the safety of people and equipment, but should not be so low as to cause false alarms, sometimes caused by background gases, sensitivity to other gases or vapors, or sensor signal drift. If false alarms are a problem, one option is to use voting: two detectors must detect hazardous gas levels before the alarm activates. In determining optimum alarm levels for fixed gas detection systems, consider the following:

- Applicable industry standards or codes
- Fire/explosion risk of the gas(es)
- Toxicity of the gas or vapor
- Typical background gas levels
- Size and magnitude of the potential leak
- Whether the area is occupied or unoccupied
- Time required to respond to the alarm
- Corrective actions required

Nanotechnology MOS (NTMOS) sensors significantly improve MOS performance in both arid and humid environments



Selecting Gas Detectors

Third-party approved

Fortunately for users of fixed gas detectors, a number of independent agencies now have documented safety and performance criteria for fixed gas detectors. Manufacturers must submit their instruments to these agencies, or affiliated test labs, for testing to ensure compliance with the standards and mark their product as "certified." Independent product safety and performance certification benefits end-users by providing a level of assurance that the product being considered for purchase is actually fit for duty. Following is a summary table of agencies and criteria to which they require compliance:

Intelligence

The latest fixed gas detection instruments and systems often offer on-board digital intelligence, meaning they deliver diagnostic capabilities, historical data logging, digital communications protocols, and provide additional microprocessor-based functionality. The most dominant digital protocols include HART and RS-485 Modbus, although proprietary digital protocols are also available.

Mean time between failure

New gas sensing technologies are available that significantly improve the mean time between failure. Foremost of these new technologies are

non-dispersive infrared (NDIR or simply IR) optical gas detection devices that sense the presence of flammable hydrocarbons based upon their tendency to absorb infrared energy in a certain wavelength. This nondestructive measurement technique results in overall excellent service life expectancies, as long as 10 years in some cases.

Sensing technologies for combustible gases

For detection of combustible gases, the most common choices are catalytic and infrared sensors.

Catalytic sensors detect a wide range of combustible vapors, including hydrocarbon, hydrogen, and acetylene. Catalytic sensors offer good repeatability and accuracy with fast response time and low initial cost. A catalytic sensor's greatest weakness is that at high combustible gas concentrations, there might be insufficient oxygen to catalyze all of the combustible gas, resulting in a decreased signal of gas concentration less than 100% LEL. Catalytic sensing requires routine calibration (typically every three months or less). Catalytic sensors are susceptible to poisoning from exposure to a substances such as silicones, halogens, tetraethyl lead, acid, pvc vapors, and other corrosive materials. Sensors can fail without annunciation, hence the requirement for routine calibration or bump testing.

Infrared (IR) detectors are immune to poisoning from contaminants and require less maintenance than catalytic. They are unaffected by prolonged exposure to gas, high gas concentrations, and changes in oxygen level. Unlike catalytic sensors, some IR detectors are fail-safe, meaning that the instrument checks itself and reports any internal condition preventing detection capability. IR sensors can detect only hydrocarbon-based gases and vapors. IR sensors do not detect the presence of substances such as hydrogen (H₂), carbon disulfide (CS₂) or acetylene. Apply IR sensors in combustible-gas applications where hydrocarbons are present.

Sensing technologies for toxic gases

Currently, two main fixed-detector families are available to detect toxic gases: electrochemical cell and Metal Oxide Semiconductor (MOS) sensors.

Generally considered the workhorses for toxic gas detection, electrochemical sensors are relatively stable, repeatable, and consistent. Used to detect a wide range of different toxic gases in a variety

Performance Requirement	FM 6310/6320 (2001) ANSI/ISA-12.13.01 (2000)	CSA C22.2 #152 (1988)	EN 61779-4 (2000) IEC 61779-4 (1988)
Unpowered storage	X	X	X
Calibration and adjustment	X	X	X
Stability	X	X	X
Alarm set point(s)	X	X	X
Temperature	X	X	X
Pressure			X
Humidity	X	X	X
Air velocity	X	X	X
Orientation			X
Vibration	X	X	X
Warm-up time			X
Time of response	X	X	X
Flooding	X	X	X
Power supply variation	X	X	X
Voltage transients		X	X
Electromagnetic field	X		X

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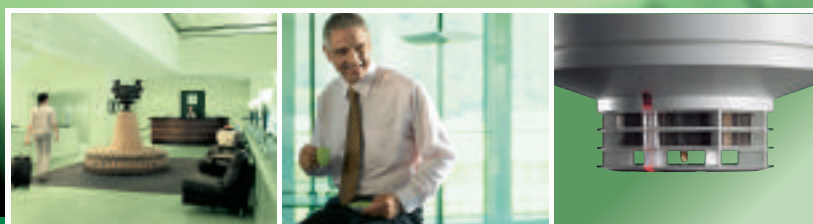
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of different applications, electrochemical sensors are available in different sizes and packages. Electrochemical gas sensor limitations include restrictions in very hot and very cold environments. Some sensors use an electrolyte that can evaporate in hot arid conditions. They are generally not fail-safe, meaning they must be visually inspected and routinely calibrated to ensure proper operation.

MOS sensor strengths include long life, wide operating temperature range, and excellent performance in low humidity environments. Historically, MOS sensor stability was not ideal in regions prone to major changes in ambient relative humidity. However, nanotechnology MOS (NTMOS) sensors are now available that significantly improve MOS performance in both arid and humid environments. These new sensors also enhance sensor speed of response to dangerous hydrogen sulfide gas concentration levels.

Installation and Coverage Recommendations

Although gas detection system design and performance requirements exist through some regulatory authorities, there are no documented rules concerning optimum detector placement or quantity requirements. Hazardous operation (HAZOP) analysis, along with proper planning and placement of sensors is the first step in protecting workers and assets from gas hazards within any facility. However, best practices show that identification of most-likely sequence of events leading to a gas leak, and typical environmental conditions during the leakage, are the best way to identify optimal sensor installation points.

Where and how many?

Consider these factors when evaluating optimal placement and quantity of gas detectors: gas or vapor source, ignition source, gas density or buoyancy, location (indoors or outdoors), ambient temperature, and personnel location.

Gas or vapor source: To locate potential gas or vapor sources, review Process and Instrumentation Diagrams (PIDs), facility maps, and hazardous-area classification drawings. Evaluate the characteristics of potential sources including pressure, amount of source, source temperature, and distance. Common areas for releases include pump and compressor seals, instrumentation sources, valve seals, gaskets, and sample points.

Ignition source: After determining the presence of combustible gas, identify sources of ignition – sparks or high-pressure gas release areas. Place the detector between the ignition source and any potential source of the gas or vapor.

Gas density, or buoyancy: Gas or vapor that is less dense than air (1.29 g/cc at normal conditions) will rise in still air. Gas or vapor that is denser than air will settle to lower elevations in still air. The detector typically should be placed 45.7 to 61 cm (18 to 24 inches) above level where the gas would settle. Remember that temperature affects the density of a gas. Heating decreases the density of a gas and makes it lighter. In fact, heating or cooling a gas by 30°C (54°F) changes the gas density by approximately 11%. Pre-stratification by thermal sources can delay or prevent gas detection near heated areas or ceilings. This typically occurs where heat sources are near the ceiling or where roof decks are heated by solar radiation and no

suitable mechanical ventilation is provided. If such pre-stratification potentials are present, then placement of the detector in area(s) unaffected by the stratification is recommended.

Indoors/outdoors: The environmental setting greatly influences vapor dispersion characteristics and gas detection ability. Typically, indoor settings mean that the overall hazardous area is well contained and that air flow can be identified and controlled. Ceilings and walls usually are the likely areas for gas accumulation and area delineation. Point(s) of human contact are usually identifiable. Outdoor settings mean the air flow is less controllable with few distinct areas of gas accumulation. These areas present a challenge that requires comprehensive application analysis and sound engineering judgment.

Ambient temperature: Determine the maximum ambient temperature. Include all nearby hot surfaces, such as motors, pumps, or steam lines. The maximum ambient temperature plus a safety factor of 50°C to 60°C should be less than the flash point of the monitored gas.

Location of personnel: Particularly in situations dealing with toxic gases, it is extremely important to consider the locations of people at the facility. To place a sensor accurately between the leak source and the people, review PIDs, facility maps, and hazardous-area classification drawings.

Useful accessories

The availability and routine use of gas detection system accessories often ensures proper application, operation, and maintenance of an installed gas detection system. Typical useful accessories include compressed gas calibration kits, sensor separation kits, remote gas-tubing kits, duct-mount adapters, and handheld communicators.

Combination of open and point

Optimal protection of a facility can be achieved through the simultaneous use of both open path and fixed gas detectors. Point detectors should be installed at or near known high-risk gas leakage points or accumulation areas to provide specific information on the level of gas present at these areas. Open-path gas detection systems should be installed at plant or process area boundaries, where they can monitor the plant perimeter, and provide an indication of overall gas cloud movement in and out of the facility. It is possible to identify and track the movement of gas clouds throughout the facility by monitoring the output signals of all the gas detectors on a common workstation graphic display screen.

Technology and Technique

Gas detection design relies on both technology and technique. After becoming familiar with the tools of the industry, talk with detection system providers. They will know the most effective ways to install and use the devices and system.

In general, look at process design drawings and consider where gas leaks can happen. Make sure you are using the proper technology to see the hazard. Look seriously at the safety standards you are required to meet and judge whether devices have undergone full third-party testing. And take full advantage of the experts that know the safety devices and system you decide to implement.

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- **Aviation** - Hangars; Helidecks; Crash vehicles
- **Industry** - Sprinkler systems; Foam spray deluge systems; Medium/high expansion foam systems
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Foams – asking the right questions, making the right choices

By John Allen

EMEA Marketing
Director for Tyco Fire
Suppression & Building
Products

While the petrochemical industry is undeniably one of the major users of fixed foam fire protection systems, it is essential to have a detailed understanding of the particular installation, the risks and processes before deciding on the most appropriate solution. Here, John Allen, EMEA Marketing Director for Tyco Fire Suppression & Building Products looks at some of the issues affecting system design and overviews the merits of different fire protection strategies and the foam agents currently available.

No one would dispute that the petrochemical industry constantly faces an unrivalled fire safety challenge; the processing, storage and transportation of large quantities of highly flammable and combustible liquids. While they are infrequent, large storage tank fires are, understandably, headline news and challenge all but the most professional and experienced fire fighting specialists. The cost of lost production has the potential to run into billions of dollars, and the life-threatening consequences are very real. However, risks can be minimised through the careful design of the fire protection systems, provided that this is based on a detailed and current risk assessment.

Indeed, it is an industry where the need for professionally undertaken and constantly updated

risk assessment is of paramount importance. It has to address some tough questions. What is the worst possible fire scenario; what resources would be needed to fight such a blaze; what if the fixed installations are destroyed by explosion; what sort of response would the local municipal fire service be able to provide, and how long would it take to be in place?

Certainly, the fire risk assessment should never be downgraded to the status of an occasional paperwork exercise. Risk assessment in this sector in particular must be a dynamic process and be top of the agenda, particularly when considering changes to the facilities or processes. These changes will often alter the facility's risk profiles, and this might well jeopardise the effectiveness of

existing fire protection systems that, by their very nature, must be risk specific.

And it must be remembered that, in the UK for example, the Regulatory Reform (Fire Safety) Order and the Fire & Rescue Services Act placed a whole new raft of fire safety responsibilities directly on the site owner's and occupier's shoulders. Under the Order, the onus for carrying out fire safety assessments passed from the local municipal fire brigade to the premises manager, who has the legal obligation to ensure that competent people – either employees or sub-contracted specialist risk assessors – undertake fire risk assessments of their facilities.

Holistic approach to petrochemical fire safety

While outside the scope of this article, it is important to recognise that, in addition to commissioning a well-conceived fire fighting system, risks can be minimised by adhering to appropriate design guidelines at the facility's construction stage. For example, well-designed and built storage tanks that are correctly installed and well-maintained are essential; so too is the proper use of containment techniques and the adoption of suitable passive fire protection measures.

This care and attention to fire safety detail applies to refineries and processing areas; flammable and combustible liquid storage areas, including tanks and warehousing; bund and dyke areas; vehicle loading facilities and jetties. Inevitably, such a diverse collection of fire risks calls for a comprehensive toolbox of products; foam agents and design expertise to create an optimum fire protection solution for the entire facility.

The design of fire protection systems requires specific expertise and experience in identifying the risks associated with hazardous materials and processes. Each application may well warrant a different fire protection solution, depending on the type of liquid stored or processed. So, the system's designer must consider the liquid's flash point, its boiling point, and determine if it is a hydrocarbon or a water-soluble, polar solvent fuel. This information enables the designer to complete the first part of the design process, classify the liquid, and establishes the most appropriate type of foam concentrate, its application rate and the discharge time.

To assist the designer, the NFPA [National Fire Protection Association] has developed a taxonomy for flammable and combustible liquids, which assists in developing appropriate fire protection tactics. For example, volatile liquids have a high vapour pressure and are easy to ignite, while products with a high vapour pressure and low flash point are more difficult to extinguish than products with a low vapour pressure and high flash point.

Firefighting foam options

There have, in recent years, been many advances in the field of foam concentrates, and some suppliers have been somewhat over enthusiastic when promoting their own type of generic product, the formulation of which has been dependent upon the company's manufacturing capability. However, it is important to be aware of the wide range of foams that are available today,

from low-cost but highly stable protein foams through to the latest leading-edge synthetic products, such as ANSUL® THUNDERSTORM® ATC 1 x 3. This is the latest generation of alcohol resistant AFFF foam concentrate, which was developed in consultation with Williams Fire and Hazard Control Inc, probably the world's most highly respected specialist in the fire protection of flammable liquids.

Basically, foam is a stable mass of small, air-filled bubbles that have a lower density than oil, petrol, or water. When it is discharged, it comprises three elements: the foam concentrate, water and air. Because of the product's low density, it readily floats on a fuel's surface to extinguish a flammable liquid fire by separating the fuel from oxygen. Effectively, it smothers the fire, while its high water content provides effective cooling. Well-formulated foam, correctly applied, will exhibit a number of characteristics. These include stability, cohesion, rapid fire-knockdown, heat resistance and vapour suppression; all of which will ensure that a fire is extinguished efficiently and securely to prevent re-ignition.

Briefly, the types of foam currently on the market can be generally summarised as follows:

Protein Foams:

- Stable mechanical foam
- Good expansion properties
- Excellent heat and burn-back resistance
- High fluidity
- Low fuel tolerance

Fluoroprotein Foams:

- Inherent stability of protein base
- Faster flame knock-down
- Fuel tolerance
- Greater fluidity
- Hydrocarbon vapour suppression

Aqueous Film Forming Foams (AFFF):

- High quality foam
- Low or medium expansion
- Compatible with wide range of equipment
- Good shelf life
- Concentrated agents available for 1% induction

Film Forming Fluoroprotein Foams:

- High stability foam
- Rapid knock-down

Alcohol Resistant Concentrates:

- Synthetic or fluoroprotein
- Highly versatile
- Fast knock-down
- Good burn-back resistance
- Fuel tolerant (used on hydrocarbon and polar solvents)
- Excellent prolonged vapour-mitigating properties

Of course, it is not merely a matter of selecting the foam, critically important though that is; it is equally essential to decide on a supplier of foam concentrate and provider of delivery systems. And this must be a decision that is not based on cost alone! Continuity of supply, technical support, engineering know-how, manufacturing resources and industry expertise all have to be assessed.

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Petrochemical industry applications

The petrochemical industry uses a variety of storage tanks for its products, each with a slightly different risk profile:

- Cone roof tanks (fixed roof tanks).
- Open-top floating roof tanks.
- Covered floating roof tanks.
- Horizontal tanks.

Usually, the primary protection of tanks is by means of fixed fire protection systems, with secondary protection being achieved through the use of foam monitors. Foam generators used in fixed systems have proved very successful in many installations and can provide a cost effective and reliable solution. However, any damage to the tank structure may well limit the foam generator's efficiency. This, together with maintenance issues, has led to the widespread use of sub-surface injection systems in applications where sufficient water pressure is available for their use.

Sub-surface injection of foam into a storage tank is, as the name implies, where the foam is injected into the bottom of a tank, and then floats to the surface to spread and extinguish a fire. However, this method is unsuitable for use with polar solvents, even where alcohol-resistant concentrates are used, because the fuel destroys the foam. So extreme care must be taken to ensure that the sub-surface injection technique is not used on potential gasoline blends that contain alcohol or other polar solvent additives as oxygenates.

Sub-surface injection also cannot be used on any open-top floating roof tanks or cone roof tanks, in accordance with NFPA 11 [*Standard for low, medium and high-expansion foams*]. However, the so-called semi-subsurface injection technique has all of the benefits of sub-surface injection, plus it can be used for all types of fuel. The semi-subsurface technique uses a flexible hose, which floats to the surface when the system is activated, to deliver the foam onto the surface.

Fixed monitors are a cost effective method of protecting relatively small storage tanks and associated spill or ground fires. Remote operation, which ensures that fire fighters are kept at a safe

distance from the incident, can be achieved by using electrical or hydraulic control systems. Although monitor's streams have successfully been used for extinguishing fires in larger diameter tanks, using high-flow devices and large diameter fire hoses, monitors should not – in accordance with NFPA 11 – be considered as primary protection for larger cone roof tanks with diameters in excess 18 metres.

Fixed systems can also be used for floating roof tanks; foam pourers are used to protect the rim seal area, with the foam being contained by a dam. However, good foam fluidity is essential to ensure that rapid coverage is achieved, and some oil companies have adopted a belt-and-braces approach and installed both foam pourers and sub-surface systems on covered floating roof tanks.

Horizontal tanks have been known to rupture following an explosion, so it is necessary to ensure that the bund area is adequately protected. Fixed low or medium expansion generators can be used to create an effective foam blanket, even on larger bund areas in major tank farms, and any residual fuel in the tank can be protected using a monitor. In reality, monitors can be used to protect the bund area, but this results in much higher foam consumption. At least two monitors are recommended to protect larger bunds to ensure full coverage and access to devices under all wind conditions.

Truck loading racks require special attention as a fire in this location can easily escalate and threaten lives. Foam can provide a quick knock-down with the added advantage of vapour suppression and containment to prevent re-ignition prior to the cleaning-up process. Foam is delivered through a combination of an overhead foam/water deluge sprinklers supplemented by low-level ground sweep nozzles. Additional protection is provided against radiant heat, and structural cooling is beneficial to prevent further damage. Monitors can provide cost effective protection, but coverage remains an issue and the designer must be certain that this strategy will deliver the site's fire protection objectives.



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Typical first response situation involving chemicals



Life Preserving Standards

Standards covering protective clothing first began in the 1980s. Up until then garments used by first responders did not give consistent protection. So following an incident involving leaking chemicals from a railcar, the National Transportation Safety Board in the US recommended that government agencies support the development of protective standards. The result was the preparation of standards NFPA 1991 and NFPA 1992 by the National Fire Protection Agency (NFPA), the agency that issues standards for protective clothing for the fire service and first responders of all kinds.

By John Eklund

Trelleborg Protective Products

NFPA 1992 addresses the second tier of hazardous materials response protection. It focuses on chemical liquid splash protection, short-term intermittent contact with non-hazardous (skin-toxic or carcinogenic) chemicals that do not produce vapours.

The highest level of protection is covered by NFPA 1991. Its primary purpose is to specify protective clothing that isolates the wearer from a hazardous chemical environment that surrounds them. Complete ensembles, a suit with attached gloves that totally encapsulates the wearer including their breathing apparatus, are always thought to be required in these circumstances. With a stringent test, these are evaluated for permeation resistance to both liquid chemicals and gases. The passage of this media through the ensemble

material is measured at a molecular level using analytical equipment.

Testing incorporates:

- Permeation testing of suit, visor, glove, and footwear materials along with their seams.
- Test for resistance against a battery of 24 chemicals containing gases and liquids, including five warfare agents.
- Inflation of ensembles to determine integrity against gas penetration.
- A "shower-like" test for demonstrating integrity of clothing against liquid penetration.
- Burst strength, puncture/tear resistance, low temperature performance, abrasion resistance, and flex fatigue testing of suit, glove, and footwear materials.
- Break strength testing for seams and closures.

Classification number	Type	Product standard	Test to define type
1	Gastight top level of protection from solids, liquids and gases	EN 943-1	EN 464 pressure test
1a	Gastight, breathing apparatus worn inside a protective suit	EN 943-1	EN 464 pressure test
1aET	Type 1a for emergency teams	EN 943-2	EN 464 pressure test
1b	Gastight, breathing apparatus worn outside the suit	EN 943-1	EN 464 pressure test
1bET	Type 1b for emergency teams	EN 943-2	EN 464 pressure test
1c	Gastight, air fed suit (breathable air fed into the suit; no breathing apparatus)	EN 943-1	EN 464 pressure test
2	Air fed suit (see 1c) but not gastight	EN 943-1	EN 464 pressure test
3	Liquid-tight protection	EN 14605	EN 463 jet test
4	Spray-tight protection	EN 14605	EN 463 spray test
5	Protection from particles	EN ISO 13982-1	EN ISO 13982-2
6	Low exposure/risk protection from liquids	EN 13034	

- Leakage and mounting strength testing of exhaust valves.
- Evaluation of the functional use of the ensemble and dexterity of gloves.
- Additional options cover protection against liquefied gas and flash fire.

Also of relevance to protective clothing are levels of protection, originally developed for respiratory equipment, defined by the US Environmental Protection Agency (EPA). These go from A through to D, where D is the lowest and A the highest level of protection.

Level D applies when there are no contaminants and splashes, immersion, or where the potential for unexpected inhalation or contact with hazardous levels of chemicals can be prevented within the working area.

Level C protection is required when the concentration and type of airborne substances is known and the criteria for using air-purifying respirators are met.

Level B protection applies when the highest level of respiratory protection is required with a lower level of skin protection. The main difference between Level C and Level B protection is that atmospheric concentrations and other selection criteria permit wearing of an air-purifying respirator. Equipment therefore includes positive-pressure, full face-piece self-contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, inner and outer chemical-resistant gloves, face shield, hooded chemical resistant clothing, coveralls, and outer chemical-resistant boots.

Level A protection is required when the greatest potential exists for exposure to hazards and where a very high level of skin, respiratory, and eye protection is needed. Clothing and equipment includes positive-pressure, full face-piece self contained breathing apparatus (SCBA) or positive pressure supplied air respirator with escape SCBA, totally encapsulated chemical-and vapour-protective suit, inner and outer chemical-resistant gloves, and disposable protective suit, gloves, and boots.

There are no standards linked to the EPA level of protection except for NFPA 1992 which equates to EPA level B and NFPA 1991, corresponding to level A. These standards are voluntary and there is no legal obligation for users and manufacturers to comply. However, in order to obtain federal grants for Chemical Protective Clothing (CPC) procurement, compliance with the applicable NFPA standard is usually required. Independent institutes and laboratories such as the Safety Equipment Institute (SEI) and Underwriters Laboratories (UL) manage certification and approval to NFPA standards.

In Europe the basic requirements for all Personal Protective Equipment (PPE) on the market are outlined by directive, 89/686/EC. This requires CE marking and for this purpose products are divided into three different categories. Category 1 is PPE of simple design, for example sunglasses. Category 2 is "intermediate", everything that is neither 1 nor 3. CPC belongs to Category 3 for PPE of a complex design that protects against serious risks.

Harmonisation of the specific requirements evolved within CEN, the European standardization organization. A series of classifications for different types of CPC and levels of protection were devised. These are detailed above with relevant standards.

The PPE directive is implemented through national legislation and monitored by an authority in each member state. For category 3 PPE, third party approval is required. Notified bodies, test institutes that are accredited for performing compliance testing and approval of PPE, perform this. To achieve CE marking not only is product examination and approval needed but also manufacture by a quality control system according to the PPE directive and ISO 9000, as approved by a notified body. Alternatively, the manufacturer can make an agreement with a notified body for sampling and testing of the PPE being produced at regular intervals.

There is a relationship between the European and American standards with NFPA 1991 relating to levels 1 and 2 of the European standard for gastight and air fed suits. However the American tests are more stringent with a minimum breakthrough time



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	USA	Europe	
Standard	NFPA 1991	EN 943-1	EN 943-2
Test Chemicals	24 Specified	At least 2 none specified 15 Specified	
Liquids	19		12
Gases	6		3
Chemical resistance test method	ASTM F739	EN 374-3 or EN ISO 6529	
Detection limit of permeation test	0.1 µg/cm ² /min	1.0 µg/cm ² /min	
Preconditioning of primary suit materials prior to permeation test	Flexing & abrasion	None	
Duration of permeation test	At least 60 minutes	10 minutes	30 minutes – if failure – include note in manual
Test temperature or chemical permeation resistance test	+27°C (+81°F)	+23°C (+73°F) or 20°C (+68°F)	
Chemical resistance test of zipper/closure	Penetration resistance for 60 minutes after 50 opening/closing cycles	None	Penetration resistance for 5 minutes
Warfare agent resistance	Chembio testing with 5 agents for minimum of 60 minutes at +32°C (+90°F)	None	

of 60 minutes, where EN 943-2 stipulates 30 minutes and EN-943-1 only ten. More importantly are the detection limits for permeation rates. For NFPA 1991 these are ten-times more challenging at 0.1 µg/cm²/min versus 1.0 µg/cm²/min for the European standards. In addition, for NFPA 1991, testing is against a larger battery of chemicals at higher temperatures, includes resistance testing against warfare agents and additional flexing plus abrasion prior to testing. Also, like in Europe, manufacturers' quality control systems are regulated for NFPA 1991, with yearly checks on facilities.

More details are included in the comparison above.

When choosing an ensemble there are a number of other factors linked to the standards that should be considered. Firstly will an ensemble with over cover, outer gloves and boots be necessary to meet both NFPA 1991 and EN standards. Generally this is the case. However, with advanced material technology a number of manufacturers can achieve the European standards with a single layer, significantly enhancing manoeuvrability and

comfort. Due to the much higher demands of NFPA 1991 there are few single skin, one layer ensemble certified to this standard.

Other considerations when selecting an ensemble are reusability and limited use. Limited use CPC can be made just of plastic laminate, are of a relatively low strength, typically 250-300 N, limited durability with flex cracking at less than 5000 cycles and cannot be decontaminated or even hygienically cleaned.

A reusable suit must be made of rubber or rubber plus plastic laminate on woven fabrics. This must be strong with a tensile strength typically between 1000 and 1500N. It should demonstrate durability and resistance to flex cracking over 50,000 to 100,000 cycles, be flame retardant and capable of decontamination. To conform to higher standards the use of reusable as opposed to limited use suits is recommended.

Additionally there have been recent concerns about ensemble storage life. The NFPA standards require that a statement regarding ensemble storage life be included in user information. The Safety Equipment Institute (SEI) has become aware that for some ensembles manufacturers are claiming indefinite storage life. The SEI is therefore advising that statements such as 'unlimited storage life' or 'indefinite storage life' are not acceptable unless they can be substantiated. They also state that this evidence should be made available on request.

Finally, and importantly for any employer to note, is that much legislation requires them to provide their workers with the 'best level of protection available'. If it can be shown that this was not done then the employer may be liable to compensate for any injury that a higher level of PPE would have prevented. Generally, as in many first response situations the risks are unknown, this means that PPE certified to both European and US standards is recommended. In this way an employer can then be certain that they have covered all eventualities.

APF

An ensemble is cleaned to allow the user to take it off safely



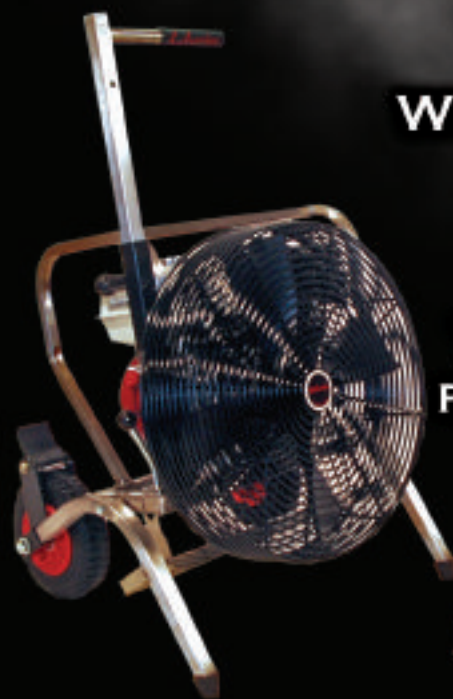
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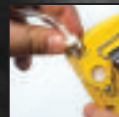
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Confined Space Rescue 101

By Mitchell C.
Baclawski

Fire Science Academy
University of Nevada
Reno

Recently I was asked to be one of the judges for an industrial rescue competition. As I am always interested in seeing responders in action, I accepted and was assigned the confined space rescue problem.

This competition energized me to write an article about confined space rescue and the good things I witnessed.

Of course I want to write a piece that will benefit the reader and I asked myself how best to do this. Well, the answer was finding a recent real-life rescue that was disastrous. This attention gaining device might engage the reader as they may have faced a similar set of circumstances on a previous rescue.

I started searching the usual places NIOSH, U.S. Fire Administration, European Agency for Safety and Health at Work, news agencies and so forth. This is always informative and full of information. In 2007, asphyxiation was the third leading cause of firefighter deaths in the USA; taking 18 lives. Sixteen deaths were related to structure fires, one drowning and one from a vehicle crash¹. I found that 65% of all confined space fatalities are due to hazardous atmosphere; in many deaths there were no gas detectors, air measuring devices, nor ventilation; one third of all deaths were supervisors; 60% were rescuers²; 25% of spaces were toxic before entry. Further, according to the Accident Compensation Corporation of New Zealand "It has been estimated that working in a confined space is 150 times more dangerous than doing the same job outside." Without doubt, confined spaces are highly hazardous environments.

What I didn't find, however, was a pleasant surprise. I was not able to find any recent confined

space rescues involving firefighter fatalities; none for many years. This, for me, is telling. Something right is happening! But what is it? Here is one idea on what is happening in the confined space rescue sphere.

As we know, it was not so many years ago we did hear of too many deaths of firefighters during confined space rescues. Since that time we developed tools and procedures to prevent rescuers from becoming victims, trained the rescuers, and implemented policies to prevent deaths. Now this winning program is well instituted in the fire house. Where the problem still exists is in occupational environment. During my search, I did find too many examples of a usual day at work going horribly wrong.

As you are aware, employers are required to have a written plan to address confined spaces in the workplace. This plan, similar to your response guidelines, should be accessible by all employees and employees whose work is regulated by these standards must be trained on the plan³. The contents of their plan should be very similar to the

¹ Firefighter Fatalities in the United States in 2007, US Fire Administration, June 2008, Page 22

² In this case rescuers are the people such as co-workers and supervisors who discovered the victim and attempted rescue.

³ In the United States this regulation is Title 29 Code of Federal Regulations, 1910.146 and related appendixes.



contents of your plan. Here is a brief overview.

Entering and working in confined spaces is a regulated activity in most places. These regulations, and we will use U.S. Occupational Safety and Health Administration (OSHA) occupational health and safety standard title 29 CFR 1910.146 as our example, define a confined space as any space large enough and so configured that an employee can bodily enter and perform assigned work, has limited or restricted means for entry or exit, and is not designed for continuous occupancy. Regulations also determine what spaces require a permit system to enter. Permit required spaces are confined spaces having one or more of the following characteristics: the potential for or containing a hazardous atmosphere; potential for engulfment; potential for entrapment or asphyxiation; and/or the potential for any other health or safety hazard.

Persons working at or in permit required spaces require specialized training if they will be entering the space, attending to those who are in the confined space, and those who will supervise the work or rescue. The attendant is an individual or team member stationed outside one or more confined spaces that monitor the authorized entrants. The entrants are individuals or team members who are authorized to enter confined spaces, and who meets all specified training for this duty. The entry supervisor is the team member responsible for determining entry and rescue operations, for authorizing entry and overseeing operations, and for terminating operations once they are complete.

Here are some general dos and don'ts for responding to confined space emergencies:

While en-route and when arriving on the scene try to obtain the following information:

- 1** What type of space is it?
- 2** Is it above or below ground?
- 3** Determine location and number of possible patients.
- 4** Determine whether it will be a rescue or recovery.
- 5** Determine all entry points and locations.
- 6** Determine all hazards; to include chemical,

mechanical, electrical, atmospheric, possibility for engulfment, entrapment and dangerous animals.

- 7** Determine if there is injury and what type.
- 8** Determine if additional resources may be needed.
- 9** Determine if the space is a permit required space.
- 10** Locate the entry permit for the space and secure it.

Also, determine if a retrieval system is in use. This system can be used to facilitate a non-entry rescue and uses a retrieval line anchored outside the space and secured to the entrant, usually to a full-body harness. Be aware wristlets and anklets may be used in some cases where a full-body harness is not feasible or creates a greater hazard.

Establish and use your incident command system.

Dispatch additional resources as necessary. Make sure you have:

- 1** Adequate EMS units.
- 2** Adequate air supplies are available.
- 3** A HAZMAT team, if needed.
- 4** Any specialist that may be needed; public works, electrical, gas, mechanical, etc.
- 5** Additional manpower that may be needed; fire, rescue, EMS, law enforcement, etc.

Together with using your confined space entry procedure, be sure to also use lock-out and tag-out procedures before making entry. In the United States these procedures are based on 29 CFR 1910.147. The scope of this standard "covers the servicing and maintenance of machines and equipment in which the unexpected energization or start up of the machines or equipment, or release of stored energy could cause injury to employees."⁴ Use lock-out and tag-out procedures for the safety of your team and patient anytime there is the possibility of the release of stored energy, or mechanical energy.

Be sure to assess all mechanical, electrical, liquid, gas and engulfment hazards. And don't

⁴ 29 CFR 1910.147(a)(1)(i)

forget to check for poisonous or otherwise dangerous animals. Shut down, shut off and close all potential sources of hazards and secure them with lock-out and tag-out procedures.

We know dangerous atmospheres account for a large percentage of confined space fatalities. Monitoring the atmosphere is critical for the team's safety. This procedure must be done prior to all confined space entries and rescue. Be sure you are checking for oxygen content, toxics and flammability. Use only intrinsically safe tools and equipment within a space with a potentially flammable atmosphere. Any space with an atmosphere that is an immediate danger to life or health (IDLH) must be ventilated before entry is made. Record test results and repeat testing at regular intervals.

Now that we have obtained as much information about the characteristics of the space, established command, called for additional resources, used lock-out and tag-out procedures to control energy sources, and know the atmosphere within the space, we are ready to make entry.

Entry decisions will be made based on the number and location of patients, safety of the entry points, and monitor readings. Only after the best method and location of entry is determined should entry be made.

All team members entering the space should be logged on the entry worksheet and their time in the space tracked. Communications are critical and a solid system for ensuring a good flow of information within the team and between the team and command has to be in place. A back-up team should be available at the entry site to support the entry team in case of difficulties or emergency.

Once locating the patient, decide whether the operation will be a rescue or recovery.

If rescue, assess the patient for medical problems and treat for any life threatening injuries. Assess whether patient can be treated in space or rapid extrication is required. Establish whether the patient needs to be placed on a supplied air breathing system. Assess whether the patient can be removed with the equipment carried in by the team and if additional team members and equipment is needed. Maintain communications with operations on patient status and any additional personnel and equipment needs.

Always use a patient removal system and device that is applicable to the situation, the size of the space, and the patient's size. Utilize a mechanical advantage system whenever possible and never use electrical winches, booms, etc. for lifting or removing patients or team members.

Basic equipment should include properly calibrated multi-gas detection devices, rescue gear including harnesses, rescue rope, and protective clothing, self contained or air line respirators with five minute escape packs, ventilation fans and ducting, and a tripod approved for rescue work.

Use caution when moving a patient out of an opening which affords the only means of egress for the team. Whenever possible, have all team members at the egress side of the opening in the event the patient becomes lodged in the opening. If a team member will be blocked during extrication, be certain the attendant and command are aware of the situation and have a plan for emergency egress. If supplied air breathing apparatus are being used, monitor air lines and keep them



clear to prevent problems.

If the operation is a recovery protect the scene for investigators and follow your local notification protocols. If your team will remove the victim, do so in the same manner you would use in a rescue.

Once all patients are removed from the confined space, all entry team members will exit the space and be logged out on the entry worksheet. Any and all difficulties or problems should be reported to command and the rescue operation critiqued after team members have post-rescue rehabilitation.

Statistics prove confined space rescues can be performed safely when following established plans and procedures. Ongoing training on your plan is necessary to maintain critical skills and refresh knowledge. Make the commitment to keep you and your team up to speed on confined space rescue.

In closing, here are some basic dos and don'ts for every confined space rescue:

Do

- Check the atmosphere using approved multi-gas detectors
- Ensure all rescue personnel are properly trained to perform the rescue
- Ensure all entry personnel have a proper tag line and communication systems
- Ensure a trained backup team is in place prior to entering the space
- Ensure all personnel know the hazards that are present in the space
- Ensure proper ventilation

Don't

- Don't enter without making the area safe by following approved lock-out and tag-out procedures
- Don't enter without checking the air for O₂, Toxics and Flammability
- Don't enter an IDLH or flammable atmosphere without first ventilating the space
- Don't enter the space without an attendant properly equipped to perform a rescue
- Don't enter a potentially flammable atmosphere with equipment that will cause a spark

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Dräger 'Horizontal Treadmill' and 'Impact Machine' in Operation



Respiratory Protection Training Systems

By Mathew Lock

Draeger Business Centre
Asia Pacific

As all SCBA users will bear testament, there are many physical and psychological considerations for the wearer during the varied operations facing our professional fire and emergency response teams; whether a new recruit or seasoned veteran.

These can include confined spaces, raised temperature and/or humidity, reduced visibility and increased workload. With each increase in task loading comes a proportional increase in risk to the personnel involved – training, in conjunction with PPE, is therefore a fundamental means of managing these risks.

As a leading manufacturer of respiratory products Dräger has responded to these operational needs and has developed a range of SCBA Training Galleries. To date Dräger has designed and installed over 500 such training systems across the world. Each of these represents an 'engineered system' that has been honed to meet each customer's specific training requirements.

There are fundamentally four key areas of a training gallery each of which plays a vital role in building the necessary skills to enhance familiarity with PPE (SCBA, portable gas detection, head protection systems, protective suits/apparel, thermal imaging cameras, communications equipment), awareness of task loading and allied

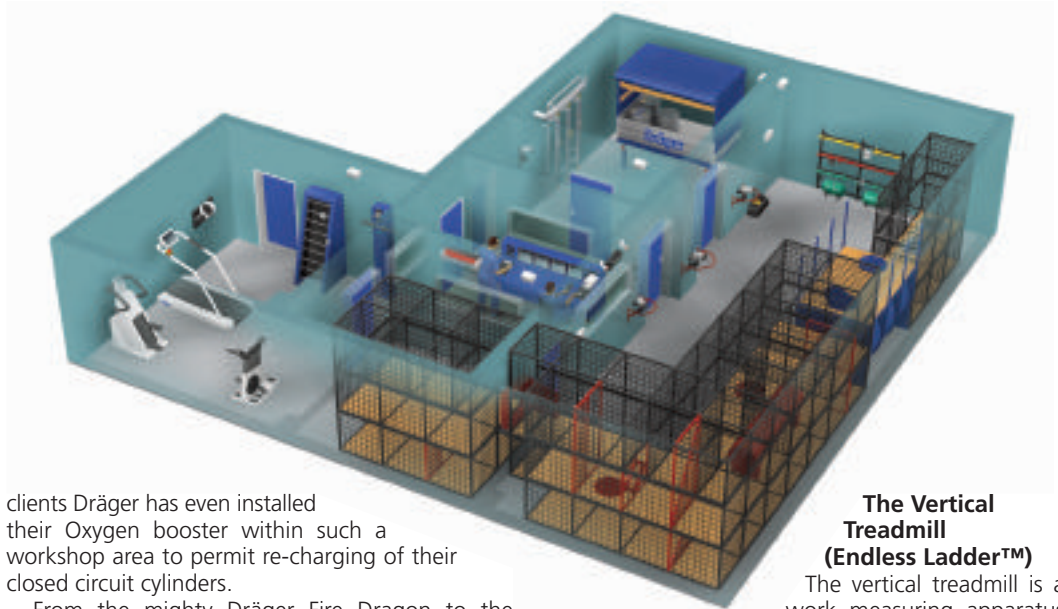
dexterity implications.

- Exercise evaluation and assessment centre
- SCBA Training maze
- Operations/skill development area
- Control centre

Fixed or Mobile

Not unlike Dräger's range of Fire Training Simulators; these Respiratory Protection training systems can be installed into a fixed training facility or instead can be mounted on a mobile platform. The configuration possibilities are almost endless.

For mobile applications Dräger engineers typically incorporate a high pressure breathing gas compressor and containment station together with a small service area/workshop facility. This enables training levels to be maintained regardless of location. During or at the end of each training day certain equipment will require attention i.e. recharging SCBA cylinders, cleaning SCBA masks, re-calibrating gas detectors – to have a suitably equipped space to do this is essential. For mining



clients Dräger has even installed their Oxygen booster within such a workshop area to permit re-charging of their closed circuit cylinders.

From the mighty Dräger Fire Dragon to the D•pod (Personnel Occupational Development) trainer – a solution can be developed to meet most requirements. With the D•pod the engineering team were also able to incorporate the Dräger handheld, LPG Propane fuelled fire extinguisher trainer; The Tutor.

Exercise evaluation and assessment centre

This is a crucial component of any Respiratory Protection training arena and can be used in a variety of ways. It is often implemented by way of stress testing each student who would be expected to wear PPE during its operation; this together with the physiological monitoring capability ensure that each participant is challenged but in a controlled and closely monitored environment.

The more common components contained within this exercise evaluation arena are:

- Vertical Treadmill (Endless Ladder™)
- Horizontal Treadmill
- Impact Machine
- Bicycle Ergometer



The Vertical Treadmill (Endless Ladder™)

The vertical treadmill is a work measuring apparatus which can be used to expose the person wearing respiratory protective apparatus to realistic physical stress as encountered when climbing raking or fire fighting ladders. This equipment includes height and speed adjustments together with an inter-locked safety beam to prevent injury in the event that student cannot continue the exercise.

The Horizontal Treadmill & Impact Machine

As the names would suggest, these 'commercial strength' machines have been developed to permit 'task specific' exercise whilst wearing full PPE. These units permit integration of the Dräger physiological monitoring package which includes pulse and telemetry data logging. These units have variable speed and duration controls which can be manipulated to suit the participant's personal and training needs.

SCBA Training Maze

These systems are used to train breathing apparatus operators in areas of confined space, stress management, improved orientation, self awareness and sharpening reaction times. Many users state the one of the greatest benefits of these maze systems results from the removal of the traditional 'comfort zone' and incorporates so many challenges in one environment.

To achieve these training objectives the Dräger team has configured a multi story, reconfigurable maze system which provides variable orientation routes, integrated obstacles and extra sensory aides such as darkness, cosmetic smoke, heat, humidity and noise.

The maze is manufactured using durable, welded mesh, special wooden substructures and non reflective paint. It includes a leveling capability and permits the use of cosmetic smoke without hindering the free passage of the ventilation system. Such a design also permits the use of IR and/or Thermal Imaging equipment.

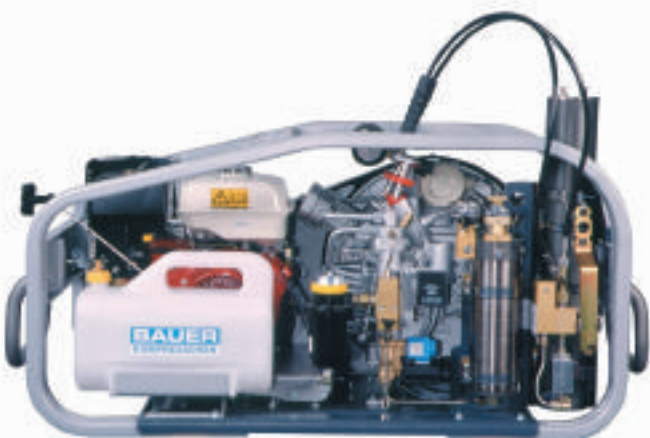
At various intervals throughout the maze Dräger insert a series of obstacles. These include, but are not limited to pipe restrictions, irregular restrictions, slopes and manhole entrances. Most of these can be re-orientated by the instructors to ensure that the training environment can be altered. This is to ensure that training diversity is

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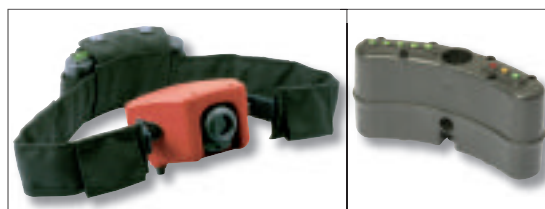
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facilitated for each student.

Dräger incorporate a range of safety systems within each maze design. Each student's progress can be monitored through the central control station using an innovative Dräger sensor technology – it is even possible to monitor multiple students at one time. Additionally, each of the training maze sections can be easily removed to provide emergency access/egress.

Operations/Skill Development Area

This is the final component of the training arena and is designed to test each participant as they conduct a series of 'work related' tasks. These include tasks such as the operation of ball valves and the isolation of electrical boxes. In today's ever changing environment Dräger has been required to enhance these training scenarios to include HAZMAT and CBRN related capabilities also.

On occasion heat and humidity is also introduced to this section of the training facility. It is important for the students to experience elevated levels of ambient temperature whilst wearing PPE and performing these tasks. Many students report that equipment familiarisation is an invaluable outcome from these exercises.

Control Centre

The entire facility can be operated via a central computer which is located in the control room. Underpinned by an industrially proven PLC hardware configuration, the Windows based operating system can provide real-time information to the controller in English, German or the local language as required.

It is important that the control team has a clear, and recordable, view of all students involved in training. As stated above, this is often achieved through the use of IR and Thermal Imaging CCTV technologies. Of course, human intervention is also a key factor so Safety Officers and/or Instructors are still required.

The central control desk is the heart of the system and all components of the facility can be controlled from here. These include:

- Exercise data logging systems (physiological equipment)
- Training maze tracking system
- Sound simulation
- Heat and humidity generators
- Cosmetic smoke generators
- Safety systems (lights and ventilation)
- IR and/or Thermal Imaging CCTV's (viewing and recording)

All data captured by the control software can be recorded and later recalled as necessary. This can be important for de-briefing and/or incident related purposes. It is also possible for remote access to be provided for the Dräger team – this can be useful for on-line product support and/or future system upgrades.

Safety – Regulations

Importantly, each Dräger Training Gallery is designed in accordance with an internationally recognised European standard: DIN 14093 Sheet 1 – Standard for training and detecting the stress limit of breathing apparatus users.

- **Design** – the layout of the Dräger Safety Training Gallery is designed in such a way that it permits free movement of the trainees and instructors between levels with minimum logistical difficulty whilst mimicking realistic operational challenges.
- **Remote Monitoring** – in addition, Dräger utilise a combination of Infrared and Thermal Imaging technology to provide visual and/or remote monitoring capabilities. These can be simultaneously recorded for later debriefing and/or data logging purposes
- **Communication Equipment** – each system incorporates a public address capability and can be designed to integrate with modern SCBA comm's tool such as the Dräger FPS 7000-COM. This second level of communication further compliments the visual systems as detailed above

"Striking the balance between safety and realism is the starting point for our engineers. Once the clients training needs are understood it is then our job to develop an engineered solution which is compliant with the European standard." stated Mat Lock, Regional Manager Asia Pacific, Dräger. "Of course we reach a point where budget also becomes a balancing factor but this just another consideration for our design teams. As with Fire Training Simulators, these training galleries have an important interface with the building or civil works. This is another key area where Dräger's Asia Pacific based teams can better support the client".

Training

Another unique offering from the Dräger team is that of training. Whether it is 'student training' or 'train the trainer' Dräger has a solution. Dräger Australia is a Registered Training Organisation (RTO) and has a wide selection of courses available. From Workplace Safety Training to PPE user/servicing training – Dräger can provide a solution.

Dräger is able to deliver individual components of these training galleries or can offer a full consultation programme. These systems reflect a modern and professional engineered solution to the current regulatory demands of the fire fighting arenas. **APF**

For more information or to request a consultation please contact Dräger Safety on the below details:

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Safer by Design

By Alec Don

GSF Slides Limited
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We all hope that we shall never have to call out the fire brigade to save our lives and property, and it is perhaps only when we do that we can really appreciate the bravery of our firefighters as they enter the building we may have just been glad to escape.

But although it is an inherently dangerous job, what is not so well appreciated is the mundane fact that 70% of reportable injuries to firemen arise as a result of the mundane-sounding activities such as lifting or carrying, or slipping. To get into these statistics, an accident usually has to be serious, so one can only imagine what additional plethora of minor scratches and bruises and pinched fingers may occur every year as firefighters go about their daily business.

Analysing all the causes of these injuries is a lifetime's work – in some cases maybe the fireman should have just been more careful, but in many others it may genuinely be the case that every day

equipment is badly designed or laid out, and no single piece of equipment is more important than the fire truck. It is the means of transporting the fire fighter and all of his or her equipment to the fire scene, and once there the firefighter needs to be able access the life saving tools of the trade without being injured in the process.

Surprisingly the safety inherently designed into fire trucks and their locker compartments can vary enormously from territory to territory. Increasingly a lot of attention is now being given to improving the locker designs, both to reduce the risk of injury and to increase operational effectiveness, and much of this is to do with the choice of

components. For example drawer carrying too much weight relative to the strength or specification of the drawer components can pose a number of injury risks:

- The drawer opens with excessive momentum and, because the ballbearing slide carrying the drawer is the wrong type, the drawer smashes through the end stops causing serious injury to the operator
- The slide mechanism simply breaks, for example as the load (eg a portable pump) is dropped back onto the drawer, again with the risk of serious injury to the operator
- Even if there is no risk of the drawer and its slide mechanism failing, an overloaded drawer slide can require too much force to open or close, and this may cause back injuries and other strains.
- It can also be the case that placing too much equipment on one drawer can make a particular piece of equipment hard to find and access.

very high resistance to damage from shock and vibration, and end-stops and beam profiles that do not fail when exposed to arduous conditions over the life of the vehicle.

By standardising on a stronger slide the vehicle builder can work with the fire department customer on a new or non-standard drawer design with the certain knowledge that the components will be fully fit for purpose, reducing the engineering time taken to tailor a compartment design without the usual costs of bespoke manufacture, as well as specifying components that match the life of the vehicle.

Stronger and better slides are however only one part of the picture. Inappropriate locking mechanism design will cause fire operators to put their hands near moving components posing a substantial risk of pinching and other similar injuries. If such latches are also mounted at the edge of a drawer then the operator may not have both hands in a position to control the movement of

By standardising on a stronger slide the vehicle builder can work with the fire department customer on a new or non-standard drawer design with the certain knowledge that the components will be fully fit for purpose, reducing the engineering time taken to tailor a compartment design without the usual costs of bespoke manufacture, as well as specifying components that match the life of the vehicle.

The problem of overloading of drawers is of course best addressed by very careful pre-planning by the fire department of exactly which pieces of equipment go into which lockers and onto which drawers, and commensurately increasing the number of drawers to ensure that every piece of equipment is rapidly and safely accessible. This has the added benefit that after attending a fire emergency, it is easy for the crew to put the equipment back on the vehicle and check that nothing has been forgotten or lost.

The use of cold drawn steel (as opposed to cold rolled) with both principal and reinforcing bearings enables fire truck builders to standardise on a strong and cost effective slide component for whatever drawer function is envisaged, based on

the drawer – many drawers are located at head height, and some of these latch designs are used in conjunction with unguarded angle-iron increasing the risk of injury as well as the potential seriousness of the injury.

These are all risks that can and should be designed out of the vehicle. Probably the safest design entails fitting the drawers with a double front drawer handle with a central unlocking plunger. The locking mechanism is designed to interact with modular glass reinforced plastic slide and tilt mounting brackets, to deliver a number of key advantages in safe locker design:

- The operator has good and positive control of the movement of the drawer, with no risk of damage to fingers from loads inside the drawer

that could slide forward as the drawer is opened and tipped down.

- The handles are glove safe, and hands are kept well away from moving components and pinch risks.
- The drawer self locks as it is pushed closed.

The use of these modular components to create slide out drawers and slide out and tip down drawers has been accompanied by the increasing use of high quality positive lock and friction lock tool mounts inside the drawers and storage compartments. These enable tools and other vital equipment to be held securely and remain undamaged as the vehicle travels to the emergency scene, and once there crews that have been trained on the location of every tool on the vehicle can swing quickly and efficiently into action.

Paul Beard, Fleet Manager at Avon Fire and rescue Service told us

“Over the past few years we have got much more involved in pre-planning the layout of the lockers on our fire trucks, and there have been undoubted benefits for us both in terms of reducing our injury rates, but also in terms of improving our overall fire-fighting capability.

Our suppliers have done a fantastic job in terms of helping us to specify better and safer drawer systems”

Fire departments in other territories such as the USA, India and South Africa are increasingly looking outside their home territories for good design ideas and components wherever they may be found. Michael Wilbur of the New York Fire Department and one of the USA's leading trainers on safe vehicle driving techniques told us

“We have a lot of diversity in the physical size and strength of individual fire fighters, particularly with growing numbers of females joining departments, and we are currently commissioning some extensive studies on the challenges this sets us on the design of equipment – simple issues like the step heights on ladders and the height and weight of compartment drawers.

We are now having a close look at the range of components being used on our fire trucks compared to other territories such as the UK, and the approach these components embody towards safer better vehicle design.”

Better vehicle design will not eliminate all accidents but the vehicle lockers and drawers are possibly the most important point of interaction between fire fighter and vehicle. It unquestionably makes sense for fire departments to put more time into pre-planning the layout of these compartments and to invest in better components to improve vehicle and fire fighter performance and vehicle life.

The components – which include glass reinforced plastic slide and tilt brackets that are actually stronger than their steel forbears, cold drawn steel dual bearing reinforced telescopic slides, strong glove safe handles and locking mechanisms and high strength positive locking tool mounts – are all selected to deliver better vehicle and operator safety and – ultimately – fire fighting performance.

If that means that the fire fighter who bravely walked into the building we just escaped also walks out again because he was able to get there just that little bit sooner and with the right equipment, then that is unquestionably a good thing.

Thin and weak – cold-rolled-steel slides pose a danger



Slide failure can cause fatal injury. This slide deformed and the end stops failed with the result that the heavily loaded drawer fell outwards. Switching to cold drawn steel reinforced slides largely eliminates such risks.

Operator safety designed out



With no handle on the front of the drawer the Operator has to hold the drawer face with his or her fingers inside the drawer and therefore at risk from loose loads

The draw lock is located at the edge of the drawer adjacent to the weak cold rolled sliding mechanism posing a significant pinch risk to the operator. It also forces the hands into positions where they do not naturally have good positive control of the drawer movement

Operator safety designed in



In this slide and tilt configuration the drawer is fitted with a strong double-hand front handle with push button lock, giving the operator a glove safe handle, and excellent central hold with which to control the movement of the drawer. In addition all the contents of the drawer will be securely held in position against vehicle and drawer movement using positive and friction-lock tool mounts. **APF**



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TETRA – Terrestrial Trunked Radio – is a digital trunked mobile radio standard developed by ETSI, the European Telecommunications Standards Institute, to meet the needs of Professional Mobile Radio (PMR) user organisations. TETRA provides speed, security and resilience for users whose lives may depend on mission critical communications.

By Phil Kidner

TETRA Association

Although originally a European standard, TETRA has been adopted around the world. It is present in over 100 countries, serving many sectors including public safety – fire, police, ambulance, highway patrol and coastguard services, among others; transportation, utilities, government and military, commercial and industrial and oil and gas.

The TETRA air interfaces, network interfaces as well as the services and facilities are specified in sufficient detail to enable independent manufacturers to develop infrastructure and radio terminal

products that interoperate with each other. The TETRA Association developed the Interoperability Certification process and continues to manage it to enable a truly open multi-vendor market for TETRA equipment and systems. This multi-vendor market gives concrete benefits both to the users in terms of a wide portfolio of compatible equipment, fast development of new product models and competition; and to the industry in terms of a wider accessible market, faster market take-up and increased opportunities to invest in new developments.

Increased competition and choice

The ability for full interoperability between different manufacturers' products is a distinct advantage of the open standards developed by ETSI. The TETRA standard is supported by several independent manufacturers, and this increases competition, provides second source security and allows a greater choice of terminal products for specific user applications.

By far the largest market is that of public safety, where the trend is for the deployment of nationwide networks shared by all public safety organisations. Not only is this economic, but most importantly it enables the public safety services to fully interoperate during emergency situations and disasters.

The flagship event of the TETRA world is the TETRA World Congress. This year the Congress was held in Hong Kong, the first time it has taken place in Asia since TETRA became operational in 1997. In the 12 months to May 2008, the Asia-Pacific TETRA market has doubled, making the region the fastest-growing critical communications market in the world.

The success and market uptake of TETRA has also created a strong base of application developers who are able to provide a wide variety of applications for use with TETRA today. With the implementation of TEDS, the TETRA Enhanced Data System, on networks in early 2009, TETRA will increasingly be utilised for secure data communications as well as voice.

TETRA terminal for potentially explosive environments



At the TETRA World Congress in Hong Kong in May, Motorola launched Asia's first MTP850Ex ATEX intrinsically safe TETRA terminal, designed to provide comprehensive user safety in potentially explosive environments. SK Energy in Korea is the first customer in Asia to use the terminal.

The MTP850Ex is certified under the ATEX and IECEx international certification schemes for protection against the most explosive gas and dust clouds when users are dealing with fire incidents and accidents with fuel, gas and other explosive substances.

Mission critical information on demand – Fighting fire with data

TETRA's flexibility and open standards enables the networks to be leveraged to suit specific needs. In The Netherlands, there is an ongoing project to deliver extensive incident data to fire crews before they reach the scene – enabling them to be as informed and well-equipped as possible.

A case study from The Netherlands



Han Arends is ICT manager for Dutch Fire Department of the Safety Region IJsselland. From 2002 to 2004 he was project leader of the migration to the C2000 TETRA network. In 2006/2007 Han was project leader of a pilot project for the implementation of mobile data communications for the Fire Services.

C2000 is a multi-agency network, and has been in use since 2004, mainly for voice communication. Outdoor coverage is guaranteed, indoor coverage is not guaranteed. In Special Coverage Locations such as tunnels and shopping centres there are additional provisions for indoor coverage.

In the Netherlands there are 25 Safety Regions, and the Police, Fire Services and Ambulance services all use the C2000 network. In the IJsselland Safety Region there are about 2,500 users of the C2000 network and one call take and dispatch room for all Public Safety Services with a common system.

While the speed, resilience and security of TETRA technology is essential to all the users, the Fire Service has a particular need. The immediate availability of information can mean the difference between life and death when the fire services are called to an incident.

For example, at a road traffic accident, if cutting

equipment is needed, the fire personnel need to know the electric wiring map of the vehicle so they know where it is safe to cut.

Fire and rescue services called to a burning building need to know how many people are in the building, their exit routes, any hazardous materials stored on site, and the location of fire hydrants.

In 2007, a pilot project involving 12 fire vehicles was instigated to evaluate the use of mobile computing. Essentially, the project team wanted to ensure that the fire personnel are equipped with as much information as possible before arriving at an incident.

The basis of the project was this: When a 112 emergency call is received, the control room dispatch system, which is connected to geographic information system, automatically sends the location information (x/y coordinate) to the fire vehicle. The in-vehicle navigation system starts automatically and presents the relevant information to the crew, such as ground plans, fire hydrant locations information about hazardous materials, electrical wiring circuits, and so on.

Deciding on the data

First, the project team identified the data related to the work process of the fire and rescue services. This included:

- Incident data from the call-taking and dispatch system such as incident
- classification, location information and the presence of/need for other units (police and ambulance)
- Specific Public Safety navigation e.g. priority 1

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- Illumination devices consisting of lamp and support
- Radio communication systems
- Refracting bands

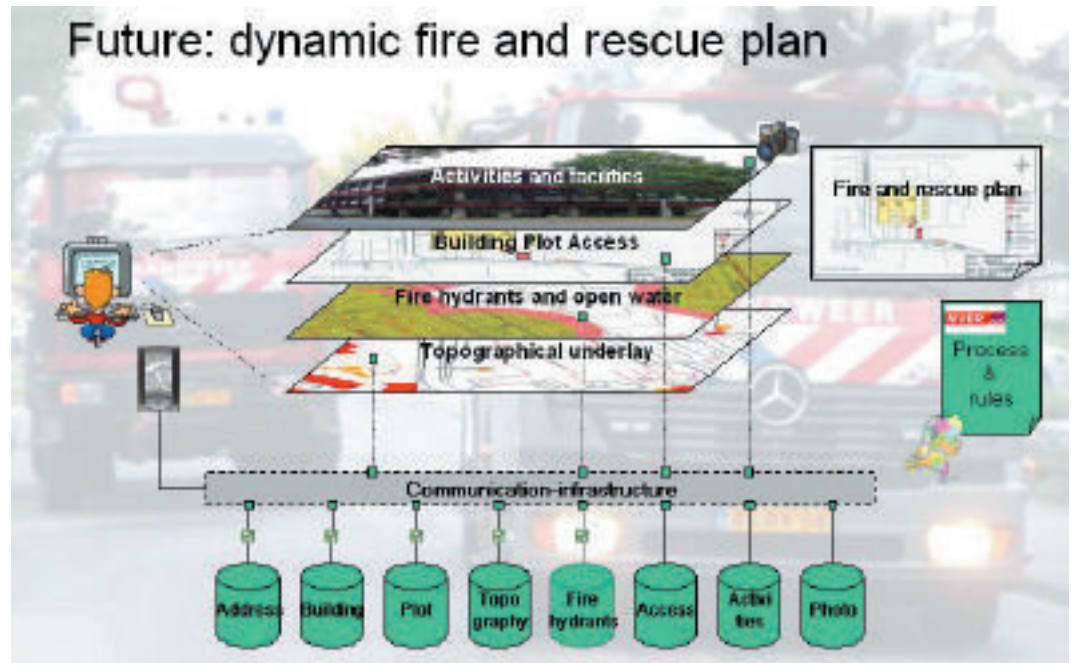
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Fig 1. Future dynamic fire and rescue plan



- Fire hydrant locations from the water company
- Crash Recovery vehicle information from the Central Registration Office
- Hazardous materials
- Architectural plans

This data forms the basis on which to build: in the future more data will be added, such as streaming video and telemetry data.

A distinction is made between dynamic and static data, and between mission-critical and non-mission-critical data. Mission-critical data is necessary for approaching the incident and for the safety of fire personnel and civilians. It could include Incident/object data and information on hazardous materials.

Data management now

At present, the fire and rescue plan is a PDF document showing all relevant data, maps and photos. The first phase in the project is to store the maps and data in the vehicle terminal.

The system in the vehicle is based on a geographic information system called CITYNAV.

The data stored in the vehicle terminal includes navigation information, information about hazardous materials, architectural plans, Crash Recovery System (for rescuing victims from crashed vehicles safely) and fire protection information.

The data is administered on a central system in the fire station and synchronized by a wi-fi network. Information management is very important. The control centre provides incident information such as location data and a description of the incident. There is only communication of dynamic data from the control centre to the vehicle. This is mission-critical information, carried over the C2000 TETRA network.

Data management in the future

In the future, the project aims to achieve highly reliable data, a higher level of security and less data management. The mobile data terminals in the fire vehicles will not store data so there will be no local data management needed. This also reduces problems if the mobile data terminals are

stolen. The only exception is the digital maps – these are stored locally because they have to be updated once or twice a year. Accessing data directly from the source ensures high quality information as the data management is the responsibility of the data owner, such as the local government or water company.

This future fire and rescue plan is no longer a static PDF document but will be built 'on demand' with data obtained directly from the sources. Users can click on the icons on the map to get additional data.

The data connection has to be reliable, rapid, and must have enough bandwidth. Authentic data sources with basic information about buildings will be available in The Netherlands in about three to five years. The expectation is that broadband mobile networks will also be available in this period.

In the future, a hybrid network will be used: the combination of TETRA system (for all mission critical communications) and a public or private complementary network such as GPRS or UMTS. The communication is two-way: AVLs and mobile messaging.

The Dutch Fire Services have utilised the C2000 network to provide mobile data applications, achieving a high degree of reliability required for a system based on centrally stored data.

With a gateway incorporated into the control centre to automatically transfer location and incident information to the fire vehicles, and the TETRA system complemented with public networks such as GPRS and UMTS, the Dutch Fire Services have also developed a vision for data management in the future.

The first experiences are positive. It is very important that the use of mobile terminals is implemented in the work processes and that the information is reliable. 'First work processes, then technical solutions'. As noted earlier, information management is also very important. The Regional Fire Services in IJsselland will provide all their first-response vehicles with mobile data terminals by 2010.

APF

The TETRA Association

The TETRA MoU (Memorandum of Understanding), now known as the TETRA Association, was established in December 1994 to create a forum which could act on behalf of all interested parties, representing users, manufacturers, application providers, integrators, operators, test houses and telecom agencies. Today the TETRA Association represents more than 150 organisations from all continents of the world.

The TETRA Association provides a forum for all those interested in TETRA to encourage adoption of the standard, and supports initiatives to obtain appropriate levels of spectrum such that growth in operational TETRA systems is not restricted by regulation. For more information please visit www.tetra-association.com



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ALLIED SOLUTIONS (I) PVT LTD

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Mumbai 400 088
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MOUNT EVEREST ENGINEERING COMPANY

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CEBU ERNBRI IMPORT, INC/ AQUAVENTURE WHITETIP DIVE SUPPLY

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BRISTOL UNIFORMS**AUSTRALIA****PACIFIC HELMETS AUSTRALIA PTY LTD**

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ASIA PACIFIC FIRE

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December 2008 Issue 28



Front Cover Picture: Search Ops in Sichuan, China.
Picture courtesy of SCDF DART

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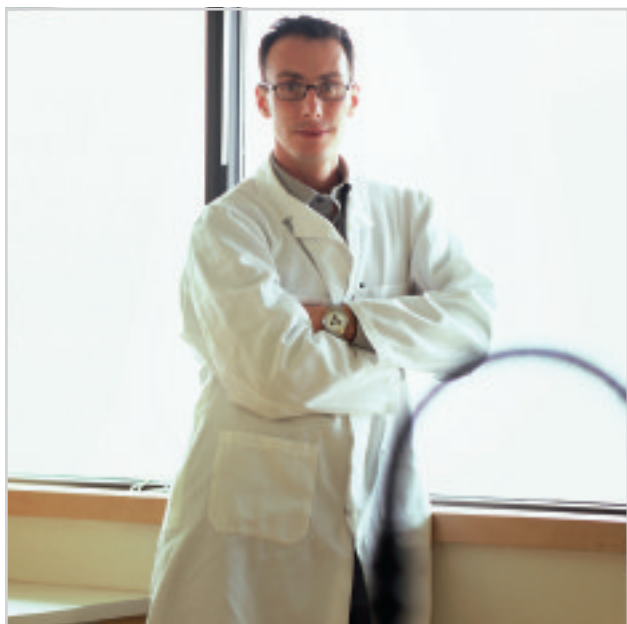
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JUST THE FACTS ABOUT HFCs IN FIRE SUPPRESSION



NONE OF THE CURRENT GLOBAL REGULATORY INITIATIVES PLACE RESTRICTIONS ON THE USE OF HFCs IN FIRE PROTECTION. IN FACT, HFCs CONTRIBUTE LESS THAN 5% TO GREENHOUSE GAS EMISSIONS (GHGs). FIRE EXTINGUISHANTS REPRESENT LESS THAN 2% OF ALL HFC EMISSIONS, CONTRIBUTING LESS THAN ONE-ONE THOUSANDTH OF 1% TO EMISSION RATES.

DuPont science is at the forefront of solutions that provide the best balance of performance and environmental responsibility in fire suppression applications.

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Foreword

Fireworks and the upcoming Holidays

By James M. Shannon

NFPA President & CEO

It is not uncommon to hear of horrific fireworks catastrophes in the news. A few years ago, on December 30, 2004 a fire at a rock concert in an unsprinklered disco in Buenos Aires, Argentina killed 191 people. It was the largest loss of life in a fire in Argentina's history. The fire started when fireworks thrown by a spectator set fire to the combustible acoustic lining of the ceiling, presumably made with polyurethane foam. What a terrible way to end the 2004 year for the Argentinians.

There have also been incidents when fireworks are manufactured, transported or stored. In 2006, 36 people were killed in Linji, China, when fireworks ignited an explosion at a fireworks warehouse. In 2002, three separate incidents in India involved explosions at fireworks storage facilities, killing, 14, 13 and 12 people respectively.

While these types of large scale events garner significant attention, it is also important to be aware of the dangers associated with the use of fireworks by the general public. At NFPA, one of our concerns, as we enter the end of the year holiday celebration, is that more people will put themselves or the general public at risk because of the use of consumer fireworks. Every year NFPA warns the public about the dangers of consumer fireworks. Our position has been unequivocal on fireworks since 1910. We believe that fireworks are simply too dangerous to be used by consumers.

Many people think fireworks are not so treacherous, especially believing things like sparklers or other novelty items are harmless. The reality is that these items are quite dangerous. A sparkler throws off showers of hot sparks and can burn at temperatures that may exceed 1600

degrees Fahrenheit. Each year there are thousands of fires, many injuries and sometimes deaths associated with the use of consumer fireworks.

Holiday celebrations can be a beautiful way to express the symbolism and significance of an observance. Besides the traditional December celebrations many countries see heightened fireworks use around Chinese New Year. But as we enter the holiday season, the public needs a reminder that everyday safety messages still apply during the holiday season, as well.

Fireworks are too inherently dangerous to be used by consumers and retail sales of fireworks should be banned everywhere.

From NFPA, best wishes as you prepare to celebrate the upcoming Holidays. Remember, the best and safest way to enjoy fireworks displays and celebrate with your family and friends is to attend public displays where only trained personnel will be involved in their use. This is the only way we will prevent needless deaths, injuries and fires.

We also invite you to view NFPA's latest public service announcements and other up to date information on efforts against the use of consumer fireworks at www.nfpa.org/fireworks.

Fire Asia 2009

"Fire Asia 2009"- an international conference and exhibition, hold from 9th to 11th February 2009 in Hong Kong. The event is jointly organized by the Institution of Fire Engineers (Hong Kong Branch), the Ambulance Service Institute (Hong Kong Branch), the China Hong Kong Fire Protection Association, Hong Kong Institution of Engineers with the full support of Hong Kong Fire Services Department.



The event specifically targets emergency service professionals, building control personnel, fire safety engineers, consultants, architects and designers of fire safety systems. It aims to provide professional fire safety practitioners with a platform to meet, network and discover new product solutions.

All types of products and service in fire field will be exhibited by then.

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Industry Leaders Announce New CAFS Product

Elkhart Brass and Waterous Worldwide Collaborate on the Revolutionary ICS



ELKHART BRASS MFG. CO., INC, in partnership with WATEROUS WORLDWIDE, is proud to announce the new Intelligent CAF Selector (ICS) for Unibody electric valves, a valve discharge controller which brings CAFS functionality to a whole new level.

With the ICS, firefighters have a single control point for the discharge – no additional switches, controls or gauges needed. Both valve position and pressure are clearly displayed on the controller. A “CAF ON” button activates the CAF discharge air valve and precisely gates the water valve. A second button, “CAF SELECT,” toggles between three user selectable air-foam solution ratios with clear language description of the selected mode.

“In nearly every situation in which multiple CAF discharges are employed, the ability to control the air-to-solution ratio independently at each discharge is mandatory for effective foam,” stated Don Sjolín, Vice President of Marketing and Strategic Development for Elkhart Brass. “With an ICS-equipped Waterous CAF system, producing CAF is extremely simple yet the operator retains the flexibility to produce the right foam at each discharge.”

The ICS was designed specifically for Waterous CAF systems used in conjunction with Unibody electric valves. Geary Roberts, President – Waterous Arizona Operations, noted, “Waterous is always committed to creating products which maximize operational efficiencies for fire scene personnel. Since Elkhart shares our customer oriented focus, working together on the ICS presented the ideal opportunity for us to combine our strengths into a unique CAFS product.”

For more information, please contact: Don Sjolín, Elkhart Brass, Inc.
Email: dsjolin@elkhartbrass.com Website: www.elkhartbrass.com

Dr Sthamer – Hamburg launches new environmentally friendly Alcohol Resistant Fluorine Free foam

DR STHAMER – HAMBURG, has launched at the Fire Service College, Morten in Marsh, UK their latest development, Moussol FF 3/6.

A revolutionary new Fluorine Free alcohol resistant fire fighting foam, the foam has been specifically designed to answer the calls for an environmentally friendly foams which does not contain Fluoro-Surfactants.

The foam can be used at 3% induction rates for Hydrocarbons and 6% for Polar Solvents, it has been certified to EN1568 parts 1, 3 and Part 4 with a rating of 1A/1B.

It can be used with all types of foam

making equipment, Monitors, Branchpipes, over the top pourers, etc.

Moussol FF 3/6 can be used with fresh, salt, brackish and recycled process water.

This latest addition to the Dr Sthamer-Hamburg arsenal underlines the company's commitment to remaining at the forefront of Fire Fighting Foam development.

For more information, please contact:
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New Confined Space Tank Lighting Kit

WOLF SAFETY's new Tank Lighting Kit, CE marked for ATEX compliance, provides a quick and easy portable temporary lighting solution in Zone 1 Hazardous Areas where potentially explosive gases, vapours and dusts may be present.



The Kit comprises a Zone 1, 230V or 110V to 24V Ex transformer supplying extra low voltage for use in tanks and vessels, and four LL-500 fluorescent leadlamps, with either twin or quad lamp configuration. Each lamp is supplied with 20m SY cable and fitted with ATX 2P+E plugs and sockets for connection in the explosive area. Easy maintenance is a key feature of this product range, with standard replacement compact fluorescent lamps which can be fitted in minutes, readily available from electrical wholesalers.

Tank Lighting Kits are available in numerous configurations, the most popular being four 2x36W lamps for use with tripods or magnetic brackets, giving 180° of light output. Alternatively, a kit comprising three 2x36W lamps and one 4x36W lamp providing 360° high quality ambient light is particularly appropriate for use with a stand to mount the lamp vertically and elevate it away from any residue.

A full range of accessories is available, including protective film, magnetic fixings, tripods, and stands using the integrated Unistrut-compatible mounting points. Wolf Safety also carries a full range of spares to minimise downtime for the user.

Typical applications for this versatile Lighting Kit, include vessel entry, tank cleaning and routine inspection work, as part of programmed preventative maintenance shutdowns in potentially dangerous confined spaces, frequently encountered in the aircraft, oil & gas, petrochemical and utility markets.

For more information on this product range contact Wolf Safety Lamp Co Ltd on 0114 255 1051, info@wolf-safety.co.uk, or via our website www.wolf-safety.co.uk

Vibraphone® and Vibrascope® by Scorpe

The Vibraphone® and the Vibrascope® are highly respected products in search and rescue operations. SCORPE equipment is in use by rescue teams the world over and has proven invaluable in casualty location in earthquake areas such as Turkey, Mexico, Pakistan and China...

The Vibraphone® is an acoustic listening device designed especially to detect and locate casualties trapped under rubble after explosion, building collapse, landslides, construction cave-ins, mine disasters and earthquakes. It is lightweight and easy to carry. The exceptional sensitivity of the Vibraphone®'s sensors ensures even the quietest noise made by a casualty is detected. The unit is fitted with adjustable filters to deaden the effect of ambient sounds such as traffic, drilling or earth-moving equipment. Using the sounds detected, the operator is able to indicate to his team members the location and placement of the sensors, enabling them to approach casualties as closely as possible.

The Vibrascope® is a video system used to locate and rescue casualties trapped under rubble. Using the Vibrascope®, it is possible to explore the collapsed structure and communicate with the casualty via the integrated microphone. The Vibrascope® comprises of a robustly protected camera fitted to a sturdy telescopic boom allowing for 360° vision. Once the casualty is located, it is possible to communicate with them, gaining important information on their state and condition, as well as reassuring them until the rescuers are able to reach them.

The Vibraphone® and the Vibrascope® have been established for 20 years. Accept



no imitations. Many claim to have the performance and capabilities of these equipments but none can actually match the Vibraphone® and Vibrascope® for durability and performance in the field.

Scorpe Technologies has also a full range of fire and rescue equipments such as monitors, nozzles, PPV blowers, lifting bags....

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FPA Australia to develop 'passive online' learning resource for fire service technicians

The new online training resource is set to build skills among fire service technicians and address current skill shortages

The FIRE PROTECTION ASSOCIATION AUSTRALIA (FPA Australia) is building on existing e-learning skills to deliver online learning resources to passive fire service technicians. These resources will assist fire service technicians to identify, inspect, test and maintain passive fire protection products and systems.

The new online learning resources are being developed to help address skill shortages within the area of passive fire protection. Virginia Krumins, Learning and Development Consultant for FPA Australia says, "Currently there are limited opportunities to develop passive fire protection and smoke containment expertise. The online training is a step towards tackling skills shortages by helping technicians to build passive fire skills at their own pace."

The live online resource is expected to be available to fire service technicians by early 2009. The learning and assessment materials will provide a media-rich learning environment for the following national units of competency:

- PRMPFES33A – identify fire and smoke doors.
- PRMPFES35A – inspect and test hinged fire and smoke doors.
- PRMPFES36A – identify passive fire and smoke containment products and systems.
- PRMPFES39A – inspect and test passive fire and smoke containment products and systems.

The project work is funded by the national training system's e-learning strategy, the Australian Flexible Learning Framework (Framework). The Framework provides the vocational education and training (VET) system with the essential e-learning infrastructure and expertise needed to respond to the challenges of a modern economy and the training needs of Australian businesses and workers.

For more information, please contact:
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Bullard Introduces Two New Thermal Imaging Accessories

Mobile Command Center and TacPole Offer Firefighters the Edge in Fire Safety

Bullard, the leading manufacturer of thermal imagers, introduces two new thermal imaging products that provide firefighters with an added advantage when responding to an emergency. The digital Mobile Command Center and TacPole are product accessories for firefighters using Bullard Thermal Imagers.

Designed with firefighter safety in mind, the new and improved Mobile Command Center digitally records video transmitted from a Bullard Thermal Imager and encourages team viewing with its large 15.4-inch monitor and two-channel receiving capability. This all-in-one unit gives commanders the ability to view an incident from a command station by receiving, displaying and playing back video transmitted from a thermal imager.

Built with the same rugged quality as the Bullard Thermal Imagers, the Mobile Command Center is enclosed in a briefcase-style design for easy maneuverability and operation. It is tripled powered so it can run off a 110/240v wall, 12v vehicle, or from an internal battery for more than three hours. Other features include recording directly to the unit's SD memory card, a dry erase board for easy note-taking, and the added benefit of recording and displaying video for documentation, evidence or training purposes.

When firefighters enter a building they need to quickly identify blocked or confined areas. The TacPole lets firefighters see areas that are not easily viewable.

By attaching a Bullard Thermal Imager to the TacPole, firefighters now have the capability to see over walls, attics, suspended ceilings or into basements or collapsed buildings.

The TacPole features a remote screen display designed to rotate and slide so it stays viewable. The remote display also detaches from the pole and can be viewed by another firefighter. Other features include a quick-attach design for easy transitioning of the thermal imager from the pole to a handheld operation and electrically isolate hand grips that prevent electrocution. The TacPole can also be equipped with an optional integrated transmitter that works with the Bullard MobileLink™ or Mobile Command Center wireless receivers. The TacPole can be extended into three sections, reaching more than six feet in length and retracting to 30-inches when fully stowed.

Bullard introduced its first firefighting thermal imager in 1998 and since then has become the market leader. Currently, there are more than 20,000 Bullard Thermal Imagers in service in the firefighter and law enforcement market worldwide.

Founded in 1898, Bullard is a leading manufacturer of personal protective equipment and systems worldwide. Product lines include thermal imagers, respiratory protection devices, hard hats, and firefighter and rescue helmets. Bullard is headquartered in Cinthiana, Kentucky.

APF

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Draka Raises Alarm About Document B Non-compliance

Cable manufacturer, DRAKA, is raising the alarm over what it says is widespread non-compliance with an important fire safety provision of Approved Document B (Fire safety) to the Building Regulations. According to Draka, Clause 5.38 of Volume Two (*buildings other than dwelling houses*) Protected Power Circuits – does not appear to be universally understood, applied or enforced outside of the London area.

The company points out that, under Clause 5.38: "In large or complex buildings there may be fire protection systems that need to operate for an extended period during a fire. Further guidance on the selection of cable for such systems is given in BS 5839-1, BS 5266-1, and BS 7346-6." The problem, Draka explains, appears to be that cables are still being specified and installed for these safety-critical installations that do not comply with the stringent requirements of BS 7346 -6, despite the fact that



Draka's third-party approved Firetuf Powerplus cable meets the demanding requirements of BS 7346-6:2005

compliant cable is available.

"It is hard to see why so many building control officers around the country are not rigorously enforcing this requirement," said Draka's Marketing Services Manager, Mark Froggatt. "It is even more bewildering that compliance seems to be restricted to the London area."

He continued: "There must be a suspicion, in addition to a lack of

awareness of the availability of BS 7346-6 compliant cable, that perhaps there is a failure to understand the importance of Clause 5.38 or a misinterpretation of what is a 'large or complex building'? The aim of Clause 5.38 is to ensure that there is a robust power supply in any building where life safety is dependant upon the reliable operation of active fire precautions or electrically-operated passive measures. This includes buildings with sophisticated fire detection and alarm systems; smoke venting systems; electrically-operated fire doors and smoke curtains; firefighting lifts; pressurisation and depressurisation fans; motor-driven smoke control dampers; and pumps for sprinkler systems and wet-risers."

"Certainly," he concludes, "the type of 'large or complex building' envisaged by the authors of the revised Approved Document B could reasonably be taken to include all multi-use or multi-function buildings, high-rise structures, buildings with complicated or lengthy evacuation protocols, and high-hazard structures."

Other than costly mineral insulated cables, there are thought to be just two cables currently on the market that can claim to satisfy the demanding requirements of Clause 5.38. However it is believed that, currently, only one of these options is third-party approved. This, Draka points out, is particularly important as it is the only way that the specifier, installer or building control officer can be sure that the cable being supplied is built to exactly the same standard and specification as the cable that was originally tested and approved. As is frequently being pointed out by BASEC [British Approvals Service for Cables], if a cable is from a producer that does not have third-party accreditation there is, in reality, no guarantee whatsoever that it is manufactured to the standard being claimed for it.

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Towermast™ Announces New Option for Nightscan Vertical Light Tower

TOWERMAST, a WILL-BURT COMPANY, is announcing a new internally wired camera option for their vertical telescoping mast. Emergency scene management and safety are greatly enhanced with the addition of cameras for monitoring, recording and surveillance. Cameras can provide a unique perspective of the emergency scene and with zoom capabilities, personnel on the ground can survey the scene quickly and efficiently. Cameras provide real-time monitoring and provide accurate records and documentation.

Towermast's camera features include a built-in 26x optical zoom lens that produces high quality, clear crisp images. There is also a built-in image stabilizer function that prevents blurred images. Pan and tilt functions controlled by a remote allow for full scene coverage.

The new camera option joins a complete line of telescoping masts and accessories available from Towermast for emergency services personnel, including the Nightscan line of light towers. The Nightscan line includes roof-mounted light towers, vertical-mounted light towers, as well as portable masts that can elevate lights or cameras. Towermast also provides a complete line of accessories including light fixture positioners, remote controllers (both wired and wireless), panel mount controllers and power line and obstacle detection safety systems.



Pic courtesy of Towermast, a Will-Burt Company

For more information, please contact:

Towermast, a Will-Burt Company

Tel: +65-6742-6654 Website: www.willburt.com

Sperian Respiratory Protection France

Sperian Respiratory Protection France, part of Sperian Protection Group, inherits more than a century of safety expertise and innovation culture. Now we are one of the breathing apparatus business leaders on the market, manufacturing disposable half-masks, escape breathing apparatus using chemical Oxygen, as long duration SCBA.

Working in close collaboration with Fire brigades, Civil Defences, Armies and Industry professionals has allowed us to put at your disposal performing reliable and latest advanced technology apparatus.

Fruit of many years of research, Fenzy X-Pro is a unique concept gathering the latest innovations for unfailing comfort and reliability in toughest conditions. It has been designed and developed by professionals for professionals to offer Firemen a Self Contained Breathing Apparatus meeting all their requirements.

Materials which compose the Fenzy X-Pro combine comfort and high performance. Resistant to hostile environments such as extreme temperatures or chemical ejections, they guarantee unrivalled endurance and lifetime.

With its new "Extreme Comfort" harness concept, Fenzy X-Pro passed the flame engulfment test as per EN 137: 2006 standard.

Its ultra light back plate includes the Easydo system allowing adjusting it vertically in 2 positions and an articulated waist belt to follow all the hip movement of the wearer.

As regards the cylinder innovative systems, the Fenzy quick-fix permits to replace them quickly and easily. The foldable and movable foot of the back plate protects the HP system.

Comfort is reinforced by the Fenzy Opti-Pro mask with full panoramic vision without optical distortion and by the Fenzy SX-Pro new first breath demand valve.

Safety is optimized by new dedicated technologies: the Fenzy Angel II multifunction monitoring device and the Telemetry system.



Made of two parts, the Fenzy Angel II has a unique design separating the system and the display. The weight of the display unit fixed on the strap has been reduced to a minimum, but the functions are numerous:

- Automatic start when cylinders are opened
- Digital pressure gauge
- Remaining duration
- Automatic distress signal unit
- 2 different alarms electronic and whistle
- Automatic self-test
- Temperature sensor
- Optional tally key
- Black box
- Radio link.

Operating between -30°C to +70°C, the Fenzy Angel II has a unique feature: In case the display becomes ineffective, the parameters and alarms are kept in the main unit. All alarms will continue to work.

Fenzy Angel'Metry telemetry systems:

Keep an eye on Firemen remotely, using a data broadcast: Fenzy Angel'Metry transmitter relay stations are available so that the signal is never lost between the Fenzy Angel II monitoring devices and the Fenzy Angel'Metry monitoring station, even on areas where signal spreading is much more difficult (car parks, confined spaces,...). With a computer or a PC tablet, equipped with the Fenzy Angel'Metry software, you are informed in real time of the situations of your brigades entered in action for a maximum safety: Temperature, Duration, Remaining pressure, Alarms. . . .

In case of danger, it is possible to activate an individual or common recall signal from outside. **APF**



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SPERIAN
 Protection you can trust

GasAlertMax XT Multi-Detector

BW Technologies by Honeywell announces the arrival of the GasAlertMax XT multi-detector for H₂S, CO, O₂ and combustible gases. Simplify remote sampling in confined spaces with the GasAlertMax XT's non-intrusive integrated sampling pump and SmartSample diaphragm pump technology. Compact and field tough, the GasAlertMax XT, with one-button operation and flexible user options, the GasAlertMax XT provides ease of use and simple compliance to industry safety standards.

GasAlertMax XT is ideally suited to a range of applications and customers including confined space entry, oil and gas, marine and shipping, utilities, wastewater treatment plants, power generation and municipal needs.

For more information on the GasAlertMax XT, visit www.gasmonitors.com



Det-Tronics Introduces Ultra-Fast H₂S Gas Detector

NTMOS sensor uses nanotechnology in a Metal Oxide Semiconductor (MOS) sensor to save lives.

DETECTOR ELECTRONICS CORPORATION (Det-Tronics) today announced an NTMOS hydrogen sulfide (H₂S) gas sensor that detects low H₂S gas concentrations in five seconds or less while tolerating harsh environments that experience extreme temperature and/or humidity conditions (ntmos.det-tronics.com). Det-Tronics is part of UTC Fire & Security, a unit of United Technologies Corp. (NYSE:UTX).



Third-party tested to ISA-92.0.01, the NTMOS H₂S gas sensor detects hydrogen sulfide in conditions that harm electrochemical and standard MOS sensors. The sensor is packaged in a rugged housing, protected by a sintered stainless steel flame arrestor, and can be installed in Class I, Division 1 locations. The NTMOS gas sensor can be installed as a stand-alone sensor or combined with a display for local indication.

"We look forward to partnering with customers to reduce the occurrences of hydrogen-sulfide injuries and deaths," said Cliff Anderson, Marketing Director at Det-Tronics. "Our new detector alerts people to the presence of hydrogen sulfide in less than half the time of other detectors. And the onboard humidity and temperature sensors ensure accurate and repeatable readings."

For more information, please visit www.det-tronics.com

Fire Product Search launches E-Newsletter



FIRE PRODUCT SEARCH the world's most popular fire product and equipment guide has launched a new monthly E-Newsletter service. The E-Newsletters contains the latest fire products, information on the latest fire exhibitions plus specialist industry news and insight.

For your copy subscribe to Fire Product Search for FREE at www.fireproductsearch.com

Fire Product Search is an online portal to the world's largest database of fire products. It offer users clear product information and easy links direct to manufacturers websites, no need for bulky directories, CD's, downloads, or anything else. Fire Product Search is online constantly providing you with information when you need it!

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PBI Performance Products, Inc Hires UK Sales & Marketing Manager



PBI Performance Products, Inc., Charlotte, NC, USA is proud to announce that Ian Callaghan has been hired as the Sales & Marketing Manager for the UK. Mr. Callaghan has spent the past ten years in various marketing roles with COSALT (Ballyclare), one of PBI's manufacturing partners. Ian will be responsible for working with the entire market chain, including PBI yarn and fabric producers, garment making partners and UK Fire Service end users. "PBI has established an office in Derby, England, and we will announce those details shortly," states Walt Lehmann, VP Sales & Marketing. "We are extremely pleased to have Ian representing PBI."

Ian will report to Helmut Zepf, European Director of Sales and Marketing. "We are thrilled to have someone on board with the experience and industry respect that Ian Callaghan brings," says Mr. Zepf. Ian will begin his new position on 23 August in time for Fire and Rescue 2008 in Liverpool.

For further information, please visit www.PBIproducts.com

Richard Kelleway to stoke Tyco fire business in Asia-Pacific

On October 1 2008, Richard Kelleway was appointed president of *Tyco Fire Protection Services Asia-Pacific*, a new division within leading fire protection solutions and electronic security company Tyco Fire & Security, which incorporates well-known Australasian brand Wormald.

The move is set to unite and re-energise the fire businesses across Australia, New Zealand, Fiji and Asia with Kelleway charged with encouraging the previously disparate teams to work more collaboratively, share research and development, and strengthen Tyco's fire businesses as regional industry leaders.

"By streamlining our fire businesses into the one division, Tyco can now offer its Asia-Pacific customers a more unified team dedicated to the delivery of exceptional fire protection services and innovation within the industry. While Tyco's renewed focus will certainly reinvigorate the Australasian business, I envisage that this new direction will also allow us to significantly enhance our profile and offering in the growing Asian sector," he said.

"Another benefit of the restructure will be our ability to provide a cohesive and complete service to Australian customers looking to employ Tyco for their Asian operations."

Tyco Fire Protection Services Asia-Pacific incorporates 15 countries including India, Pakistan, China, Singapore, Hong Kong, Korea, Malaysia, Thailand, Philippines and Taiwan. While Australia and New Zealand currently account for nearly half of the Asia-Pacific fire businesses, the potential growth markets in Asia are likely to result in an increased proportion of the business being generated by Asia over the next few years.

Initially, India and China will be the main focus for the business, with India boasting the biggest emerging market and China offering a significant growth market. India's key strengths lie in the vertical markets such as power and automotive buildings, while China also has a large power base as well as a wealth of minerals businesses.

Tackling these two markets will not be without a number of challenges, namely labour and Tyco's competitors. Kelleway's team will need to garner a good understanding of the locals and their business methodologies before adding to its staff. Furthermore, Tyco needs to continuously communicate its expertise and the benefit of using a one-stop-shop for design, installation, commissioning and service and maintenance in order to



compete with other multinationals operating in the region.

The new structure will enable Asia to take a number of key learnings from the well-established and highly successful Australasian market which they can then adapt for their own marketplace. At the same time, the Australasian team will be encouraged to review the Asian businesses and adopt identified best practices.

"We're likely to see a few varying technologies being employed in Asia which will make the Australasian team critique their own products and processes and evaluate if they can do anything differently," said Kelleway.

"At the same time, we hope that the Asian businesses will learn from the Australasian installation, service and maintenance expertise as well as the high standards it attains. The ANZ business is by far the most regulated market in the region and while Standards exist in Korea, Singapore and India, there is potential for proactive involvement in further regulatory development across the Asian region."

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With India's growing economy, it is becoming ever more dependant upon mass transit systems, both for visitors to the country and for its population. Nowhere is this more so than in the Indian National Capital Territory of Delhi, one of the world's most populated metropolitan areas, by some accounts ranking fourth, ahead of Moscow, Beijing, Mexico City, New York and London.

To cope with the demand throughout the metropolis, the Delhi Mass Rapid Transit System – or Delhi Metro – is being constructed and operated by the Delhi Metro Rail Corporation Limited. The first part of the network was opened in 2002 and Phase One of the project was completed in December 2005. Currently, the system is a 67km three-line network with 62 underground, surface and elevated stations. Phase Two of the network is presently under construction with a target completion date of 2010. It comprises a further 128km of track and 79 stations. A third phase of 112km and a fourth phase of 107km are planned for completion by 2015 and 2020 respectively. When finally completed, the entire network will be longer than London's Underground, with 414km of track.

At the same time, to cope with both international and domestic travel, Indira Gandhi International Airport in Delhi this year inaugurated Asia's longest runway, measuring 4.43km. A third terminal building is currently being constructed to handle an additional 37 million passengers annually, which is due for completion by the end of 2009. The airport is already the busiest in India in terms of number of daily flights, and the second-busiest in terms of passenger volume. In 2007, it handled 23 million passengers, and the planned expansion program is expected to increase its capacity to 100 million passengers by 2030.

Electrical cabinets – mission-critical assets

In keeping with mass transit operators around the world, both Delhi Metro Rail Corporation Limited and Delhi International Airport Limited are acutely aware of the need to ensure the safety of passengers and staff, and to safeguard the operations' assets and facilities. So much so that both have invested in sophisticated fire detection and alarm and security monitoring equipment.

However, both managements were quick to recognise that conventional fire detection and alarm systems would not adequately protect vital enclosed electrical cabinets upon which the facilities' entire operational effectiveness depend. The damage or destruction of these often mission-critical electrical enclosures has the potential to go far beyond the mere cost of their replacement; it could easily result in putting vital building management systems



out of operation with a major detrimental impact on passenger safety or service levels.

It was decided that the only way to ensure that this could not occur was to provide dedicated fast-response detection, fast agent discharge, and fast and effective suppression to minimise damage to the cabinets' internal components and prevent the spread of fire from one cabinet to the next.

No matter how effective and sophisticated, the facilities' main fire detection and alarm systems simply do not respond fast enough; they do not provide protection to the micro environments inside the cabinets where it is needed, and that is inside the cabinet where it can react immediately a fire breaks out. This is because, by the time sufficient smoke has escaped from the often-sealed electrical cabinet in sufficient concentration to activate a ceiling-mounted smoke or heat sensor or a beam detector, the interior of the cabinet is virtually certain to be engulfed in flames and extensively damaged, if not destroyed. So, the only effective solution is to install fire detection and suppression inside the electrical cabinet itself.

However, electrical cabinets contain a host of components such as internal sealed chambers, bus bars and cable alleys, and the internal layout often comprises small sealed compartments. These are the high fire risk areas in electrical cabinets. This means that the fire detection system needs to be installed in each and every internal compartment if the fire is to be extinguished at the earliest possible stage and any damage or disruption kept to an absolute minimum.

This is why glass sprinkler bulb-type actuators that discharge only when sufficient heat has built up around the glass bulb to cause it to break are ineffective. If the glass bulb happens to be located some distance from the source of the fire, there is the very real prospect of the cabinet's contents being seriously damaged before the extinguishing agent is deployed.

Further information on **FIRETRACE** is available from the FIRETRACE EMEA head office in the UK on +44 (0) 1293 780390, or from Firetrace International headquarters in Scottsdale, Arizona on +1 480 607 1218. The company's website is at www.firetrace.com

ts Delhi's Mass ronments



Firetrace® solution

Both the Delhi Metro and Delhi International Airport looked closely at all of the available options before independently deciding that ISO 9001-approved Firetrace International's FIRETRACE® system was the only effective and reliable solution. Firetrace was found to provide the essential detection and suppression characteristics that would ensure the effective protection of the cabinets, with a track record of more than 75,000 successfully completed installations around the world.

FIRETRACE is an automatic fire suppression system that provides around-the-clock protection. It is a "self-seeking" system; a stand-alone solution that is entirely self-contained and does not require an external power source.

The UL (Underwriters Laboratories), FM (Factory Mutual) and NFPA (National Fire Protection Association) certified system comprises an extinguishing agent cylinder that is attached to proprietary Firetrace Detection Tubing via a custom-engineered valve. This small-bore polymer tubing is a linear pneumatic heat and flame detector that was specially developed to deliver the desired temperature-sensitive detection and delivery characteristics. It detects along the entire length of the tube, so the FIRETRACE tubing quickly detects a fire at its source, ruptures and automatically releases the suppression agent, extinguishing the fire precisely where it starts and before it has had time to take hold.

The flexibility of the Firetrace Detection Tube enables it to be threaded around and throughout the cabinet's tightly-packed maze of compartments and components. It enters and leaves each compartment through the integral cable glands meaning that, in the vast majority of cases, drilling is not required, so FIRETRACE does not compromise the IP (Ingress Protection) rating of the cabinet.

Intelligent suppression

The Firetrace Detection Tube can be installed throughout several conjoined electrical cabinets (subject to certain limits). However, the FIRETRACE installation needs to have only sufficient gas to extinguish a fire in one cabinet, so the largest individual sealed cabinet in a row is used to calculate the quantity of extinguishing gas needed for the entire run of cabinets.

This means that there is sufficient suppression agent to flood the whole cabinet, but it is discharged at the single hottest point, where the fire has started. The entire content of the cylinder is instantly discharged to fill the entire cabinet to prevent re-ignition and fire spread.

Currently, 200 FIRETRACE systems have been dispatched to protect electrical cabinets for the Delhi Metro, although this will eventually rise to 800. 90 systems are presently scheduled for delivery to Delhi International Airport systems for the new Terminal Three building, but this too will rise to 300.

The Delhi International Airport uses the Firetrace Direct System, which is the most commonly used option for protecting electrical cabinets, while the Delhi Metro uses this system and the Firetrace Indirect System.

The Firetrace Direct System utilises the FIRETRACE tube as both the detection device and the suppressant delivery system. When the tubing detects a fire anywhere along its length it ruptures, forming an effective spray nozzle that automatically releases the entire contents of the cylinder. The Firetrace Indirect System uses the FIRETRACE tube as a detection and system activation device, but not for the agent discharge. The rupturing of the tube results in a drop of pressure causing the indirect valve to activate. This diverts flow from the detection tube and the agent is discharged from the cylinder through diffuser nozzles, flooding the entire enclosure.

Negotiations for both contracts were overseen by Kuldeep Chauhan of Colimanor Enterprises LLP, Firetrace International's principle trading partner for India, who worked closely with SVS Buildwell, the master distributor for India. He said: "Having FM approval was a major factor in winning both orders. It underpinned the quality of the system and clearly separated FIRETRACE from poor quality imitators with uncertified products."

He continued: "Offering a wide selection of suppression agents was another differentiating factor. A potential supplier that can offer only CO₂ (carbon dioxide) – which is widely available – is probably unable to secure supply agreements with extinguishing gas manufacturers that place stringent requirements on the companies they are prepared to supply. They may simply not understand the different fire classes and appreciate that CO₂ is not an appropriate suppression agent for all applications." He concluded: "The current Firetrace International offering includes clean agents such as 3M™ Novec™ 1230 Fire Protection Fluid and DuPont™ FM200®, along with foam, CO₂ and dry chemical suppressants."

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The Application of Performance-based Fire Safety Design in Shanghai

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In many countries around the world, building designs are shifting from prescriptive to performance-based for technical, economic, and social reasons. This paper presents the advancement and development of the application for performance-based fire safety design in Shanghai, China. These include a comprehensive analysis of advantages and disadvantages both of the prescriptive and performance-based design¹ leading to the principles of application scope and alternative technological solutions which are suited to performance-based design. It also indicates the relationships which should be received great attention to during the use of performance-based fire safety design. The Shanghai Pudong International Airport No.2 Terminal, as a case of performance-based fire safety design is introduced in this paper.

Performance-based fire safety design is for special building with comprehensive consideration of its function, architecture conformation, fire load, and conditions, etc. The design is provided on the bases of theories and methods of fire safety engineering and computer simulation and mathematics computation for realizing complete integrity of fire safety and investment benefit. Performance-based fire safety design is one of the most advanced technologies in the field of fire

protection, and one of the most active researches in the foreland as well.

1 The characteristics of performance-based fire safety design

1.1 The advantages of performance-based fire safety design

1.1.1 Goals. In traditional fire protection design, the designers only need to comply with the



principles of the fire codes. But in the performance-based fire safety design, the designer must pay much attention to the life and fire safety goals, functional and performance objectives. After identifying the fire safety goals, the designers should integrate the fire precautions by choosing freely any possible way to meet any desired criteria basing on different spaces, function demands and other related conditions of the building. Generally speaking, the primary goals of fire protection design are to provide an acceptable level of life and fire safety including safety to people, protection of property, providing for operation continuity and protection of environment from the influence of fire. It is considered that developing performance criteria and defining the boundary condition and numerical value to which the expected performance of the trial designs can be compared to meet desired the goals is the core of the performance-based design.

1.1.2 Pertinence. Performance-based safety approach provides a design according to actual circumstances of special building, but is not standard for any building. For example, in the aspect of life safety, refuge area and evacuation path must be designed in order to safeguard people from heat radiation, smoke and other poisonous gases. In the aspect of prevention of fire spread, neighborhood buildings and combustible materials must be protected from being ignited. For the design of fire protection zone, the measures must be taken to control fire within fire compartment in the building.

1.1.3 Integration. Performance-based fire safety approach emphasizes a comprehensive fire protec-

tion strategy in which all fire protection systems are integrated, rather than designed in isolation. Not only the passive, but also the active fire protection measures of the building are considered during the design. Such a comprehensive engineering approach often provides greater cost-effectiveness in construction and satisfies the client. It also helps us to achieve the fire safety target by integrating the advantages and functions of fire alarm system, sprinkler system and smoke ventilation system.

1.1.4 Flexibility. Performance-based design is unlike prescriptive design. It makes the design more free and flexible by exerting the designers' subjective creativity. It gives support for innovation on materials and form of construction resulting in development and popularization of new product and new technology. It also adapts the demand of high-tech and aesthetics in modern buildings and offers chance for an insurance company to take part in fire protection.

1.1.5 Rationality. The study of performance-based design is to perfect the traditional design and to make the design more scientific and rational. In other words, the performance-based design is not only to improve the safety standards or reduce the fire protection cost directly, but also to optimize the fire protection subsystems better under the precondition of meeting the requirements of fire safety level.

1.2 The disadvantages of performance-based fire safety design

1.2.1 Localization. On one side, performance-based design aims at special construction projects and solves main problems such as fire protection compartment, safety evacuation, smoke control, fire facilities and structure protection. It is not suitable for all buildings and all problems. On the other side, the building designed on performance-based approach should have to be designed again when it changes the function. That is the localization of the performance-based fire design.

1.2.2 Complexity. Performance-based design needs great quantity of experimental data and professional design and evaluation tools for support. While at present the basic experimental data is scattered and not abundant in China. There's no application software for large-scaled project nowadays and most of software used for performance-based design have not yet been experienced in many practical projects and fire experiments. They are still faulty and may bring influence to the optimization of the design and the veracity in calculation.

1.2.3 Difficulty. Performance-based design is a new technology which covers fields of fire science, fire dynamics, mathematics statistics, computer technology and behavior psychology during fire. It is much more difficult than prescriptive design for demanding flexibility. It needs for designers to have good theoretical knowledge, rich practices, professional training and noble morality.

1.2.4 Time consumption. Performance-based design is much more complex and difficult. Performance based design process requires more engineering time for analysis, calculation, and design documentation, and it also needs the clients, designers and related administration to discuss again and again, so it often takes much more time than the prescriptive design for the same building.

It may say a performance based design is a great achievement of brooms of clients, designers and official reviewers, and also it is a result of repeated negotiation and compromise between them.

2 The application scope and design parameters of performance-based fire safety design

2.1 Application Scope

Performance-based fire safety design has many advantages, but that doesn't mean it is suitable to all projects. It is considered that the Performance-based design will be applied to solve unusual and unique problems in complex buildings only where fire requirements are not fully addressed by Chinese national codes or where strict compliance with Chinese national codes compromises the function of the building. Generally speaking it is suitable to the projects as follows:

- 1** Large-scaled railway stations, airport terminals, exhibition halls, gymnasiums and theatres.
- 2** High-ceiling or large-volume spaces, such as shopping malls, supermarket, warehouses and logistic centers.
- 3** Public spaces with tall and large-scaled atrium.
- 4** Large clean rooms for medicine and electron, etc.
- 5** Other important buildings with potential for extremely high property or life loss.

Performance-based design should not be applied to the following buildings in principle or

where the national codes fully address fire requirements.

- 1** Habitable buildings such as residences, apartments and dormitories.
- 2** Common locations such as office rooms, hotel rooms, sickrooms and classrooms in public buildings.
- 3** Small workshop and warehouses handling with grade 1 and 2 combustible and explosive materials or goods.
- 4** Public entertainment places such as singing rooms, dancing halls, video play rooms, etc.
- 5** Buildings for old-aged citizens and places for children such as nursing homes, kindergarten or game rooms.

2.2 Design parameters

Performance-based design should be based on the following parameters except common design contents:

- 1** Characteristic parameters. It includes the characters of building, scale of fire, personnel characters, heat release speed, flame dimension, smoke quantity, temperature and density of smoke and gas, concentration of toxic gas.
- 2** Circumstance parameters. It includes evacuation preplan, influence of circumstance, fire resistance of structural component, and fire fighting capability of fire station, etc.
- 3** Time parameters. It includes time of flash over, fire spread in an enclosure space, initiation of fire alarm system, smoke ventilation system, sprinkler



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system, and other automatic fire suppression system, response of fire department, time for occupants evacuation.

4 Probability parameters. It includes data of fire statistic, dependability of fire prevention and fire suppression system.

5 Safety goals. It includes not only to safeguard people's life, to protect property and structure, but also to prevent the fire spread in order to reduce the fire losses, to provide for continuity of operation, and to limit the environmental impact of fire.

3 Key points should be paid much attention to in the application of performance-based design

3.1 The relationship between performance-based design and prescriptive design

For many buildings that are straightforward in size, shape, and use, prescriptive codes provide the designer with sufficient guidance. The prescriptive codes, in which goals and objectives are absent, set forth minimum requirements for protection and are generic by occupancy. Examples include spacing requirements for fire compartment, detectors or sprinklers, specified fire resistance, or maximum travel distances. So comparatively the prescriptive codes are convenient for designers and reviewers. Prescriptive design is the embodiment of human beings fighting against fire, and plays an important role in the aspect of fire safety design and fire loss prevention. But it also has some disadvantages, which limit the innovation of new material, new structure, new technology and new methods. As a result it influences the art creation of architect, even the shape and use of building as well.

Performance-based design has features of clear

target, flexibility and integration and provides a new way to solve the new problems. Both the Performance-based and prescriptive design have the same safety target but the different way and measure to solve problems. Performance-based design is applied to some particular buildings with complex functions, super space and super height. But prescriptive design is suitable and easy to most general buildings. In this way, the two kinds of design can't instead of each other. They can exist together in a quite long time as performance-based design is a good complementarity to prescriptive design. On the other hand, the study and practice in performance-based design in China is at the primary stage. The code and guide of performance-based design still haven't been set up. So it's helpful for us to grasp code of prescriptive design while promoting application of performance-based design approach.

3.2 The relationship between performance-based design and fire safety evaluation

Performance-based approach brings forward the project design through engineering analyzing way and focusing on the problems brought out by the maladjustment between present prescriptive codes and project practice or the incomplete and indefinite prescription. The fire safety evaluation of the total project design is the core of performance-based design. The evaluation is not only for validating whether the precautions can achieve the adaptable fire safety level of the building, but also for amending and perfecting the project design. So any item of performance-based design should be evaluated. The total fire safety level should be adaptable to related code and criterion in China. So the evaluation should base on related code and criterion, fire statistic data and simulated experiment result inside or outside China.

3.3 The relationship between popularization and steadily development

Though performance-based approach provides a useful approach to solve new problems in fire safety design and is accepted by more and more people, it is still at the primary stage and not perfect in some aspects. So it can't be considered as the only choice to solve all problems in fire safety design.

Today, fire safety design is based on the actual fire codes in China. Performance-based design is only used for buildings not be definite in present codes or some particular ones. Actually, only 1%-5% buildings are designed by performance-based approach in advanced countries, e.g. about 1% buildings in USA, 1%-5% in New Zealand and Australia, 1.5% in Germany. In China, less than 0.5% buildings are designed with performance-based approach. So it is considered that Performance-based design and evaluation should be popularized actively on one hand and should be applied steadily on the other hand.

4 The application of performance-based approach in Shanghai

4.1 The challenges for fire protection in Shanghai

Shanghai covers an area of 6430 km² with a population of more than 20 million. Since China's embarkation on the cause of reform and open to

the world, especially since 1990s, Shanghai has been developing rapidly into a city full of vigour and vitality. Shanghai will host the World Exposition in 2010. By the year 2020, Shanghai will have been turned into a modern world city characterized by a prosperous economy, high levels of social civilization and a beautiful environment. It will have established itself as an international economic, financial, trade and shipping centre. With the development and adjustment of city function and conformation, Shanghai has changed greatly with the 5 following features:

1 Many high-rise buildings. There are about 13,000 high-rise buildings more than 24m height and about 420 super-high-rise buildings more than 100m height in Shanghai nowadays. For example, Jinmao Building with 420.5m height is the highest one in China at present. International Financial Center, which is under construction now and will open in July of this year, will be one of the highest buildings throughout the world with 492 meters height up to the roof. These buildings used performance-based design which was done in conjunction with RJA, a global fire protections engineering firm.

2 Many underground spaces. There are about 15 million m² underground spaces nowadays, which will be developed more reasonable and more scalable. For example, large-sized underground suit market will be built near the Bunds of Huangpu River and 500KV main transformer for EXPO 2010 will be set in 45m depth underground. Also there are 7 tunnels through Huangpu River in use and 6 tunnels are under built. In the project of "South Tunnel & North Bridge" over Changjiang River, the tunnel is 8 km long with 15m in diameter divided



5 Many railway lines. There have been 5 lines put into use with the total length of 145km at present. 6 lines and 178 railway stations are under construction. By the end of 2010 the railway lines will reach to 400km. Besides metro lines and light track lines there is a maglev line in Shanghai.

With the all above, cosmopolitan fire problems focus in Shanghai. If the requirement of structure protection, fire compartment, safety evacuation, smoke control and fire suppression in many

Shanghai covers an area of 6430 km² with a population of more than 20 million. Since China's embarkation on the cause of reform and open to the world, especially since 1990s, Shanghai has been developing rapidly into a city full of vigour and vitality.

into 2 levels, the upper level is for roadway and the lower for railway, beside which there is a 220KV municipal electric cable chamber. It is considered to be the first multiple function tunnel throughout the world.

3 Many chemical plants. There are 5 main large chemical bases in Shanghai, they are Gaoqiao Chemical Base, Wujing Chemical Base, Taopu Chemical Base, Jinshan Chemical Complex and Shanghai Chemical Industry Park. Especially with the development of Shanghai Chemical Industry Park, top chemical companies in the world have been settled in Shanghai one after another. 1200,000 tons of ethylene plant and 10 million tons of oil refinery plant will be established in Shanghai.

4 Many big projects. Large micro-electron clean workshop, large logistics centers and large shopping malls emerge in endlessly. Especially important projects such as Hongqiao Transport Hinge Center with a 1,300,000m² syntheses building, large-sized China Exhibition Hall, Theme Exhibition Hall, Convention Center, and Art Center are under construction for EXPO 2010.

projects are executed according to the prescriptive code, the function of the building and the realization of clients' idea will be influenced and impossible. That brings great challenges to fire safety design and fire protection review.

4.2 The application of performance-based fire safety design

For the purpose of ensuring the safety development, application of performance-based fire safety design is actively promoted for some special large projects in Shanghai.

4.2.1 Performance-based design and evaluation of Shanghai Pudong International Airport No.2 Terminal

Shanghai Pudong International Airport No.2 Terminal (hereafter is called T2) is a enormous modern building group covering 485,500m² including a terminal building, an air gallery and a passenger gallery, with a capacity of 40,000,000 person-time/year. The buildings have a big-spanned shape in mixing framework system with armored concrete and steel structure. The terminal



building is 40m high and 416m long, the passenger gallery is 32.3m high and 1,414m long, and the air gallery is 42.3m high and 289.5m long.

The terminal building, air gallery and passenger gallery all have large space. It is very difficult to divide the whole space for fire compartment according to the fire code, resulting in the fire compartment too large and the evacuation distance too long. Besides there have many technical problems in steel structure protection, smoke control, fire detection and alarm, and automatic fire suppression.

Focusing on the characteristics and the function, the T2 was designed with fire safety engineering approach under the authorized computer modeling and mathematics computation. The hot smoke flowing of T2 in case of fire was simulated with the FDS software and the passenger evacuation also simulated with STEPS software. The computing software was used to account heat radiation, mist temperature, alarm and sprinkler response time in T2, and after which the fire risks and harms were analyzed and demonstrated in numerical value. Basing on these, the strategy of fire compartment, smoke control, safety evacuation, steel structure protection and fire suppression system were put forward for T2.

1 The concept of fire prevention cabin. The “fire prevention cabin” is indicated for high-fire-loaded zones such as office room and supermarket in the check-in hall. The “cabin” design will enhance the fire protection facilities in the areas with high potential of fire. It could ensure the limitation of fire disaster with integration of local fire compartment, fire detect and alarm system, smoke extraction system and sprinkler system. Such a design will guarantee the continuity of passengers moving freely and the operation of the airport without the physical compartment for large space in case of fire.

2 The concept of fuel island. The “fuel island” is indicated for area with combustible material. The “island” design will analyze and ensure the fire safety space between fixed or moving combustible material in large space of the terminal. It demands the area of every booth less than 9m² and the safety space must be roomed between booths and shops. It should also keep a reasonable space between chair areas in the waiting hall to prevent the spread of the fire.

3 The concept of fire isolation belt. The “isolation belt” means for safety distance in belt shape between two separated parts. There will design an isolation belt of 12m width between check-in hall and united-check hall, and an isolation belt of 15m width between international waiting gallery and united-check hall. There should not be any combustible material in the isolation belt. That is considered a reasonable approach to solve the problem in fire compartment in the terminal.

4 The concept of cold smoke extraction. The “cold smoke extraction” means that air conditioning system is used to exhaust the smoke after the fire is suppressed. So there will be no mechanical smoke exhaust system in some public areas with light fire load in large space of the terminal. In order to ensure the effect of the smoke exhaust, it was required to design and install automatic smoke exhaust windows on the top of the terminal after the evaluation of performance-based design.

5 The concept of subsection evacuation. “subsection evacuation” means for passenger evacuation from section and section but not from the whole terminal in case of fire. Fire may happen in some local small area within the large space of the terminal. So it's not necessary to require evacuation of passengers from the whole building. Only when the fire is extremely uncontrollable, persons in the whole terminal should be required to evacuate. Basing on performance-based analysis, it's required less than 60m for the evacuation distance in the terminal.

6 The concept of local protection. In the aspect of steel structure fire protection, basing on performance-based evaluation, only the steel components near the 18.40m level at interlayer in the waiting gallery should be protected, and the other part will be no necessary to have fire protection. That is the concept of local fire protection.

Modern buildings with different functions and shapes have been emerging in Shanghai day after day. It provides wide stage for engineers and designers in application of performance-based fire safety design and evaluation, and that will be encouraged and supported further more. **APF**

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Shen Youdi, born in Shanghai in 1954, has worked in fire service for 35 years. The current post is Chief Engineer of Shanghai Fire Department, Deputy Director of the Board of Shanghai Fire Protection Association, Master of Laws. He has organized and instituted a series of administrative prescriptions and technical standards in the field of fire protection. He is active in promotion and development of performance-based fire safety approaches, and in the reformation of administrative review and approval system of fire service. He has translated and published the two books, *Fire Problems in High-rise Buildings* and *Fire Hydraulics*, and has compiled *Fire Protection Directory in Chinese, Japanese and English*.

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The future of SCBA

By Tony Pickett

Product Manager
Breathing Apparatus,
Scott Health & Safety

Since the creation of the first “fire service”, the situations and types of hazard they face have significantly changed. With the sustained development of town and cities, urban communities have become much more densely populated, with buildings increasing in both size and height.

The population of rural areas has also increased, resulting in rural areas requiring the presence of a fire service, in areas where previously fires could “burn out” without human intervention. These fires are now fought to protect human life and property. Terrorism and its surrounding threats have also led to a change in the role of the fire service; respiratory protection may now be required for prolonged durations with the protection against CBRNE threats. There is also an increased need for urban search and rescue operations. As the role of the fire services have changed so have their requirements for their equipment.

From the advent of respiratory protection in the 1870s, when fire fighters utilised a simple respirator and filter, technology moved on and Breathing Apparatus (SCBA) became considered to be the basic tool for structural fire fighting,

When first used in the 1920s, CABA duration was approximately 20 minutes. Since this time, major advances have taken place. Cylinder technology used on SCBA has developed from

heavy steel to alloy steel, aluminium to glass-hoop wrapped aluminium and glass full-wrapped cylinders to the current technology of fully wrapped carbon fibre cylinders with steel, alloy or plastic liners. In most cases, the maximum filling pressure of these shells is either 200 or 300 bar. As well as cylinder advances, CABA have moved from negative pressure to positive pressure via a manual switching mechanism, to the current first breath activated positive pressure systems. Equipment in use today has come to use high performance technology in demand valves, pressure reducers, face pieces and integrated electronics.

Harnesses have changed to be much more flame resistant, being manufactured from Kevlar or similar material. When designing an apparatus there is now also more emphasis on materials that will be resistant to the substances used in a CBRN attack.

So where does the future of breathing apparatus lie? Performance wise; modern BA sets easily perform well above the necessary level required to

Terrorism and its surrounding threats have also led to a change in the role of the fire service; respiratory protection may now be required for prolonged durations with the protection against CBRNE threats.

Pic courtesy of Scott Health & Safety



support the fire fighter, you would have to be Superman to out-breathe modern pneumatic systems. The areas that users now look to are ergonomics, duration, integration, information systems etc.

Ergonomics

The ergonomics of the set, which includes weight, have become much more important within users specifications. Reducing the physical burden of the fire fighters is a key aim. Diversity issues also need to be catered for in the modern day fire service so having a set that will fit a wide range of body shapes is also important. Modern manufacturing techniques and advances in material sciences have opened up many more options to BA set designers and have enabled some innovative solutions to be introduced. Lighter sets more

Diversity issues also need to be catered for in the modern day fire service so having a set that will fit a wide range of body shapes is also important.

accurately shaped to the users body are now available in the market place and sets that can be adjusted to the users size and shape and allow more natural movement whilst being worn are now common place.

Duration

Extending duration is also a requirement and reducing the energy used by the fire-fighter is a small way of doing this but to have any significant increases different solutions will need to be considered. One way is to carry more air on the BA set, this presents challenges as air does have a significant weight to it. People may think that air weighs nothing but 45 minutes worth is 2.3kgs, to carry more air you also need to use larger cylinders or duo them which of course adds more weight

and before long you have exceeded the limits laid down in the standards. Currently one and a half hours is approximately the maximum limit. There are various ways to look at things for the future such as increasing cylinder pressures (higher pressures are already utilised in gas tanks for cars) although this of course has implications on the pneumatics of the set. Another option could be the integration of powered air systems with automatic switching mechanisms which allow filtered

Extending duration is also a requirement and reducing the energy used by the fire-fighter is a small way of doing this but to have any significant increases different solutions will need to be considered.

air from the atmosphere to be breathed when possible and saving cylinder air for when really needed.

Integration

Integration with other types of products is also possible, for example integration of BA sets with hoods to cater for wearers that may have beards, integration of BA sets and powered air systems that could increase the duration of sets as mentioned above. Further down the line there could be more integration of BA systems into users turnout gear, their Gas tight suits or fire helmets.

Communication

Ability to communicate during an incident is a key requirement of the fire-fighter and improvement in this area is always required. Mask design has improved with the utilisation of superior materials giving greatly improved speech diaphragms, voice amplifiers and communications devices that can be integrated onto and into the mask have also provided improvements.

In the future digital processing to remove background noise and mapping of facemask acoustics will all lead to improvements in the quality of transmitted speech, whilst wireless interfaces and modular systems allowing selection of different solutions for different applications will improve the flexibility of the communication solutions provided to the fire services.

Information systems

Over the last few years the introduction of integrated BA electronics and information systems has taken place, giving the fire-fighter extra information that may be useful to them. There has also been made available the ability to transfer the data via telemetry to a base station. The base station can provide the officer in charge or



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breathing apparatus controller critical information enabling him to make informed decisions on the fire ground or at an incident command post. There has been a slow uptake on this type of system possible due to the complication of the systems and possibly down to the high price this type of technology has to be sold at.

There is an enormous possibility of things that can be done with modern day electronics sensor technology and processing power and the future of telemetry information systems could involve team coordination, controlling crews, communication, 3D mapping, and visualisation of crews moving through an incident. However all are ultimately guided by their cost to the user and if they can be made robust and simple enough to be operated efficiently in the pressurised environment of the fire ground.

Powering these devices and battery management is now a huge issue for fire brigades and one of the major challenges for manufacturers



in terms of respiratory protection, there is always a drive to push things forward and the introduction of new technology, including telemetry systems on SCBA is a method of achieving this.

As is with a lot of new technology, development is an expensive process and manufacturing volumes are not necessarily high and this is reflected in the cost of the some of the equipment to the end user, this is in stark contrast to ever tighter budgets that have to be adhered to by the fire services.

The key thing for manufacturers to work on is making the technology both relevant and affordable and this requires the fire services to be realistic about what features are wanted and

what they can afford to pay for. It is very possible for manufacturers to design a system with all the features that ever be thought of however if this makes a single BA set cost £5000 it would of course never sell!

It is important to remember that respiratory protection is the primary function of the RPE

There is an enormous possibility of things that can be done with modern day electronics sensor technology and processing power and the future of telemetry information systems could involve team coordination, controlling crews, communication, 3D mapping, and visualisation of crews moving through an incident.

is finding suitable battery technology or alternative power sources that perform in the fire fighter's environment, are economical viable for the services and do not provide disposal problems.

Conclusion

The primary purpose of breathing apparatus and other types of respiratory protective equipment used in the fire service is clear – “to offer respiratory protection to the user and allow access to irrespirable or contaminated atmospheres for rescue and fire fighting procedures”.

Although fire fighters of today have never been better protected against the external environment

and whilst it is not suggested for a minute that fire brigades shouldn't utilise the latest technology to the fullest, careful consideration to what features are relevant to the roles that are being carried out by them should be given to ensure that the technologies that are purchased are the right ones for them and they achieve value for money.

With the pace of innovation in various areas of engineering being as it is currently, new possibilities for design are opening up all the time, therefore over the next 3, 5 and 10 years there should be many interesting developments in our field so the final message has to be watch this space!

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*Lulu – CFA's first series 1
Austin tanker – 1947*



The Austin

– icon of another era

**By Darren
Grevis-James**

All photos courtesy of
CFA's Asset
Management
Directorate and Keith
Pakenham

British manufactured cars and trucks had a reputation for being mechanically unreliable in post-war Australia, but CFA's fleet of Austin tankers proved it could stand up to the rigours of firefighting. It all began with the little tanker known as Lulu.

The Austin tankers that campaigned across Victoria more than sixty years ago could best be described as mechanically primitive. Robust and enduring, they had qualities that made them suitable for operation in the bush and town. The Austins came in two variants – the standard rural tanker and the small town unit (STU), which included 500 feet of canvas hose, a hydrant and a two stage extension ladder.

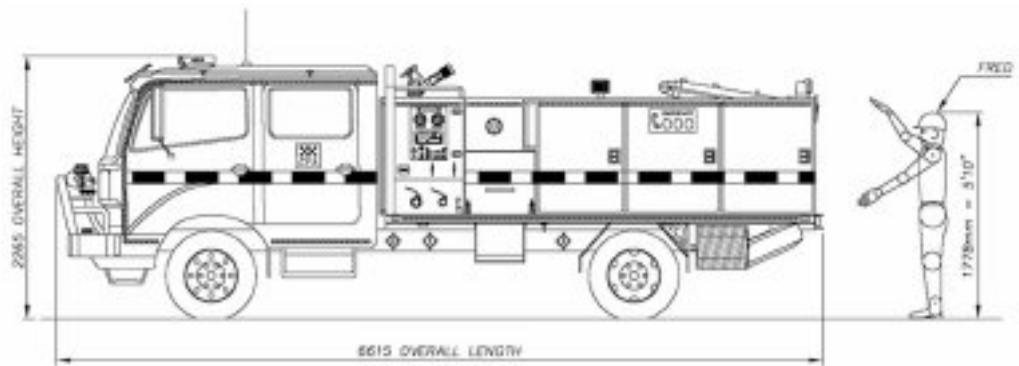
CFA began introducing the legendary Austins into its fleet in 1947. The first had the registration LU 600 and survives today at the Fire Services Museum in Newport. The Austins were assembled in Sydney and purchased as cab chassis units from Lanes Motors in Exhibition Street, Melbourne. The tray, tank and other equipment were fabricated and fitted initially by contractors then later at CFA's workshops in Ballarat.

British designed, the little truck featured a six cylinder engine with a manual four on the floor

'crash gear box'. Drum brakes were fitted to all wheels. The early Austin carried a 1300 litre steel water tank with a single stage Grazcos Mark 25B pump driven by a BSA engine mounted at the left rear of the truck tray.

Inside the cabin, there were two bucket seats, split pane windscreens and only one wiper blade on the driver's side. Stops and turns were signalled by a metal semaphore rod that was connected to the driver's door. Early on, tankers did not have mobile radios. While two crew members sat up front, there was no hard and fast rule as to how many clung to the hand rails on the back of the tanker. Monitoring the water level of the tank was an educated guess – born out of experience on the fireground, but later, sight tubes were fitted.

Rick McKay, a former CFA Regional Officer and Manager Engineering Services, says the Austins were typical post-war British manufactured



Tanker of the future

– design concept on drawing board

What will the next generation small tanker look like?

It's likely to be a combination of the best of the old and the best of the new. And it will draw on the design concept of a tanker type from more than thirty years ago – the 600 gallon International Harvester D1410.

For a number of years, CFA has been searching for a fire tanker with similar characteristics to the tankers of the 1970's; namely, the 600 gallon (2700 litres) International Harvester D1410 series. These tankers were low profile, narrow and enabled good access off-road and on narrow tracks.

Recently, CFA became aware of a low profile HINO 4WD cab chassis that is used throughout Japan. HINO Motor Sales Australia Ltd has agreed to import a market evaluation unit for CFA to construct a prototype tanker for evaluation throughout the organisation.

CFA anticipates that the prototype light tanker will be ready for field evaluation by mid-January 2009.

Tanker of the future prototype characteristics:

- Four-person cab
- 2100 litres of water
- Ultra high pressure pump and 60 metres of 12mm hose for blacking out support
- Engine-driven Power Take Off for main pump
- Three remote control monitors, variable from 40 litres per minute to 400 litres per minute
- Crew Protection spray system supported by a 24V electric pump
- Main pump capable of flows to 1800 litres per minute

Potential benefits:

- Low profile, narrow cab offering excellent off-road capability
- Significant fire knock-down capability via the main pump and remote control monitors
- Water conservation and reduction of operator fatigue by using an ultra high pressure pump and associated hose reel for blacking out
- Enhanced stowage and crew safety features

vehicles – “they didn’t like the heat much and had a reputation for leaking oil. Nevertheless, they were overall great little performers.”

“The Austin had one great attribute – ‘low reduction gearing’ which allowed the tanker to creep along at very low speed – so it was highly suitable for slow-running grass fires,” Rick said.

When the Series 1 Austin was introduced it had five important modifications, which made it a unique specification firetruck. First was the long metal pipe and rubber tube that connected the cabin with the rear of the tanker. This allowed the driver and the pump operator or branch man to communicate and follow instructions.

Second, the Series 1 Austin pump – the Grazcos Mark 25B – had a manually operated priming pump that enabled adequate water to be pumped through a delivery hose if the main power pump failed. Thirdly, the tanker had two water spray nozzles fitted to the front bumper bar. This allowed water to be sprayed onto the charred

ground ahead to ensure the tanker’s rubber tyres didn’t burn.

The fourth was the installation of a handrail around the deck of the tray and the fifth was an additional electric fuel pump to boost supply to the truck engine or substitute if the primary pump failed.

At first, flat metal seats were fitted on either side of the tank. Underneath the seats were six metal knap sacks. However, the seats were dispensed with as crews needed space to access the sides of the truck. Judging by photographs of the era, it was sometimes the case of ‘get as many men as possible onto the back’.

Over subsequent years, Series 2 then Series 3 Austins all saw service in CFA. Unlike today’s trucks that feature turbo diesel engines, power steering, air brakes, and air conditioning, driving the Austin was sheer hard work. How crews managed to get these two-wheel drive tankers up steep terrain, across paddocks and over fire trails is a remarkable feat of driving technique.

Evolution of the tanker



Fordson Blitz

From Austins to Bedfords to Internationals to Isuzus – Darren Grevis-James discovered the evolution of the CFA fire tanker has been a long journey

By today's standards, most CFA tankers in the 1950s were underpowered, uncomfortable and unsafe. They were practical but rudimentary in design and devoid of safety features that are now deemed 'standard' on CFA trucks.

When CFA formed in 1945, brigades ran a wide range of various types and sizes of tankers. In the immediate aftermath of World War II, Dodge, Ford, Chevrolet, and International K series trucks were common in both rural and urban brigades. Many of these trucks were ex-Army vehicles offloaded by the government as surplus war stock.

The first fleet

The introduction of the Series 1 Austin was the beginning of a purpose-built fleet of CFA issued tankers. Austins in both tanker and pumper variants were used extensively by CFA from the late 1940s and were still seen rattling around as late as the 1980s (see previous story). Probably fewer than 20 of the Series 1 Austins saw service in CFA and they were soon replaced by the Series 2 that

operated throughout the 1950s and 60s. Through this period, the big American trucks lived on but the composition of the CFA fleet was about to change.

It was a turning point in 1956 when CFA brought into service the Willy's Jeep type 1.4, a small four-wheel drive tanker that was ideal for rough terrain. Later that decade, the large Bedford was introduced as a 3600 litre petrol four wheel drive tanker. Bedford was a British truck from the General Motors stable of vehicles. The big Bedford had more than double the water capacity of the Austins, which were still extensively used in CFA brigades.

By 1960, the fleet grew to 773 and CFA was moving towards more powerful vehicles with bigger pumps and water tanks. In the mid 60s, International trucks appeared. The two-wheel drives carried nearly 3000 litres of water and the four-wheel drives 1800 litres. Through this period there was little other change to the fundamental design of CFA firetrucks, apart from general mechanical improvements. Various other makes



Chevrolet Pumper

Willys Jeep Tanker – 1958



and models were tried and tested including a tanker based on a BMC cab chassis – another British designed truck.

Tanker design improvements slowed down in the early 1970s. While safety was always an important consideration, as late as 1976, many CFA tankers still did not have crew protection panels to deflect radiant heat. Trucks and pumps were mostly petrol powered and subject to fuel evaporation in hot conditions on the fireground.

Then, in 1977, tanker design took a radical turn. Fibreglass components were fitted to tankers for the first time in an effort to reduce both weight and the effect of radiant heat. The International 1710B petrol powered 4x2 cab chassis included an integrated fibreglass 3000 litre tank, body and heat shields. Pumps too became more powerful. The GAAM Mk 200 petrol pumps replaced the Grazcos 35C pumps and could push out 485 litres of water per minute at 700 kilo Pascals.

The 1980s opened with the introduction of the International ACCO 510 and 610 model petrol powered heavy tankers. These had galvanised tray frames and were also fitted with fibreglass heat shield panels. Trucks from this time were becoming more mechanically sophisticated and easier to operate. During this era, CFA designed, developed and fitted anti-fuel vaporisation kits to its fleet of petrol powered appliances.

Towards a safer tanker

Following the devastating Ash Wednesday bushfires in 1983, CFA made significant safety changes to the fleet. All tankers were now fitted with heat shield panelling.

A new truck was introduced that had not previously been operated by CFA. This was the Mercedes LA911B diesel powered 4x4 cab chassis which had a 4000 litre fibreglass tank. Significantly, it was the first tanker with Roll-Over Protection Structure (ROPS). This set the benchmark for ROPS that would, from then on, become an important landmark safety feature in CFA trucks.

The Mercedes was a big impressive vehicle that carried a Godiva FWBP petrol powered pump that was capable of pushing through 2000 litres of water per minute at 700 kilo Pascals. It an expensive unit, though, and only a handful were operated by CFA.

British to Japanese

Another landmark year was 1984 when CFA followed the trend away from British and American models. The first of CFA's Japanese trucks was the

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Hino. It featured a 3000 litre fibreglass tank and was produced as two variants: the Hino GT175 4x4 and Hino FF172 4x2 diesel powered cab chassis. They too were fitted with fibreglass heat shield panels. By 1985, ROPS had become a standard feature and the Hino GT175 became the first multiple production unit incorporating ROPS.

Another Japanese manufactured truck appeared in 1987 – the Isuzu. CFA released a production version of the Isuzu 2000 litre 2WD tanker, which featured the GAAM Mark 200 diesel powered pump, a first for this size of appliance.

In the late 80s there still remained tankers that did not have ROPS. CFA commenced a retrofit program of ROPS to 362 tankers involving ACCO 610A, ACCO 1710C and early Hino cab chassis trucks to provide enhanced performance in the event of a roll-over.

Arguably one of the most important safety changes ever made to CFA tankers was the fitting of spray protection systems in case of possible burn-over. In 1999, CFA joined Stage 1 of a research project between CSIRO and the NSW Rural Fire Service to evaluate existing water spray protection systems. This culminated in the final field validation testing of a crew protection system at Tumbaramba, NSW in February 2004.

A further safety improvement was the retrofit of a Low Level Warning System to the tanker fleet that commenced in September 1999.

In 2005, CFA continued to trial new designs from the 'Tanker of the Future' project. Mack and a MAN 4x4 cab chassis trucks were trialled. These designs have taken the tankers to a new level of safety and include crew cabs complete with roll-over protection bars, prototype spray systems and curtains, rear deck access door, automatic transmission, and remote control monitors (front mounted sprays).

From those trials, CFA released production models of crew cab tankers, known as 3.4C Tankers. These were based on a Hino Pro 8Z 4x4 crew cab, which included a 3750 litre fibreglass tank and panels, a Tray area ROPS, an integrated crew protection spray system and GAAM Mk 325 pump capable of 950 litres of water per minute at 700 kilo Pascals.

During 2007, CFA released the first production of a 2.4C Crew Cab Tanker, again based on a Hino. This smaller four wheel drive tanker has a 2350 litre fibreglass tank and panels. It also features an internal and external roll-bar support, integrated crew protection spray system and a rear deck access hatch.

Fast forward to 2008 and the design evolution continues. This year, CFA commences the retrofit program of internal crew cab roll-bar supports and rear tray awnings to 3.4C Tankers that were issued without these features and/or rear deck access hatch.

Work has now started on a new concept tanker, which is scheduled to be trialled in 2009 (see story on page 32).

The evolution of the CFA tanker and the countless design enhancements that have been made over the past 60 years can be put down to the dedication of CFA members who have continued to seek ways of improving the operational capabilities and safety of the tanker.

Many people in CFA have spent a lifetime of service making the tanker a better vehicle. For those crews that operate tankers today, the comfort, safety and flexibility of their trucks are a result



Mid-2007 – Hino Pro 52

of the commitment of CFA engineers, mechanics and firefighters who, through their perseverance, have put CFA at the forefront of Australian tanker design.

APF

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How well do you know your thermal imaging camera?

By Paul Spooner

Product Manager,
Argus Thermal Imaging
from e2v

Thermal imaging cameras (TICs) have been used in fire fighting environments for nearly thirty years; the technology is well known and extensively used within the industry.

The history is well documented, but what are modern thermal imaging cameras currently capable of, and what developments lay ahead? Budgets for fire and rescue equipment can be limited, so deciding where funds are allocated is a key decision. Do you know what thermal imaging can do for you? Are TICs viewed a luxury items or are their life saving credentials, and their role within fire prevention recognised at your station?

Handheld thermal imaging technology has come a long way since its development nearly thirty years ago. Picture quality has vastly improved and to are now far more reliable than before, a good quality camera should be expected to last a minimum of five years, this in turn has reduced the cost of ownership. Many manufacturers now offer an assortment of models suited to different budget requirements, they also offer a variety of warranty packages, which can include a 2-year standard warranty for peace of mind. Technology

today offers the end-user a host of features designed to make their life in a fire safer and easier – as well as effectively assisting them in doing the job at hand!

Today cameras offer two types of temperature detection to aid fire fighters in determining the heat of their surroundings – ambient temperature measurement which gives fire fighters rapid identification of the areas temperature within the fire environment, area. Notification of these temperatures can indicate dangerous situations and the fire fighter can make a decision whether to evacuate the premises or continue the search. Spot temperature measurement enables fire fighters to pinpoint the exact heat of objects or obstacles. This saves time and extinguishant by allowing fire fighters to focus on the hottest part. This option enables fast and effective location of the seat of a fire or detecting hot spots in cavity walls or behind doors – indicating potential danger in another room. In addition, this feature



can be useful for determining the temperature within enclosed capsules or spaces, even measuring the temperature of gas cylinders. Temperature sensitivity modes are now used to expand the dynamic temperature range of the thermal imaging cameras, some cameras now having 3 modes to further increase the viewable temperature range up to 1000°C. The image on a camera LCD screen can move seamlessly from a cooler scene to a very high temperature scene without the loss of detail "whiteout".

Improved picture quality today not only allows fire fighters to view images in far more detail than was possible with older cameras but latest offerings allow full colour options. Various screen colour settings enable fire fighters to switch between monochrome all the way to full colour. This makes detecting changes in heat and finding the hottest part of an image on the screen easier, faster and more reliable thus saving vital seconds in scene assessment.

A person needing rescue in water gives off more thermal radiation than his or her surroundings therefore presents a distinctive shape on a thermal camera's LCD screen. Certain colour pallets give a better image than others do. It is better to decide which colour pallet provides the clearest image before fire fighter use the camera, it is not

recommended to change pallets during use, to do so will steal valuable time from the search.

Coupled with improved image quality comes image capture. This feature allows fire fighters using the thermal imaging camera, to take pictures at the scene of a fire. This is a significant aid in mapping the layout of the scene, taking images while assessing the scene will provide a valuable insight to other fire fighters before they enter a building, helping them avoid obstacles, locate doorways, and stairs hidden by the thick smoke.

Forensic investigation is another use for modern thermal cameras, they can capture evidence in the fire ground before it is destroyed by the blaze and can help deliver vital clues as to the source of fires and provide data for analysis and investigation. Pictures taken can be downloaded from the camera to a PC or Laptop and subsequently inserted into an incident report. This feature can also assist in training fire fighters.

Thermal cameras can be very helpful at a scene of a day or night time road traffic accident, they assist fire fighters to locate victims who have been ejected from the vehicle, or who have become disoriented and walked away from the scene. If used early at a scene, thermal imaging can also be used to determine the number of passengers in the car or truck, a quick sweep for the interior of the vehicle can detect heat sources on the seating left by the occupier, this application helps fire fighters to determine if all occupants have been accounted for. Additionally, skid mark, vehicle parts or disturbance of roadside can be identified, locating vehicles that have left the road.

Remote wireless video (telemetry) on thermal cameras allows remote viewing of the fire scene. Station commanders can monitor what is happening away from the scene and, if necessary, send in backup to help deal with an incident. This option is also useful for training purposes. In addition, telemetry allows fire fighters to record footage of what is happening in the blaze/training exercise for



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essential to the safe operation of the vessel.

Similarly, thermal imaging cameras are widely used in airports for aviation fire fighting, mounted on the outside of a fire appliance, the camera allows the driver to take his vehicle through thick smoke which means that the team can lay down foam faster and more accurately. With aircraft incidents involving hot brakes, aircraft wheel brake assemblies can be rapidly inspected to give an accurate indication of their temperature. In airport terminals, surveys of escalator

later analysis and effective de-briefing of personnel.

Finally, remote control set-up and user personalisation allows fire fighters the flexibility to enter their personal settings in terms of screen colour, white or black hot, contrast, brightness etc on the camera before entering into the fire ground. A station or brigade logo can also be uploaded onto a splash screen on cameras to improve asset tracking. All settings are defined before the fire fighter enters the blaze.

Thermal cameras today are so versatile that using them simply for fire and casualty detection is only half the story. There are a many different applications aiding not just civilian fire personnel but also marine and airport fire brigades, not only in search and rescue but in fire detection as well.

Take the marine market for instance. Incidents can start in various places around vessels but often in engine rooms or electrical systems. Overheated motors can develop into blazing infernos. Using a thermal imaging camera as an engineering tool allows gearboxes, motors and bearings to be regularly monitored facilitating the rapid identification and elimination of hotspots. Pipe work and distribution panels can be similarly investigated for faults. Condition monitoring and faultfinding using thermal cameras in this way increases safety standards on ships and helps prevent fires starting. Coupled with this, the image capture facility on modern thermal cameras enables routine controlled inspection of vessel engine rooms and the ability to download the images to a PC or Laptop helps to develop a portfolio of thorough records for external auditing and monitoring equipment performance. This leads to cost reduction in the area of engine and equipment management and safety, in compliance with marine regulations. Once a thermal imaging camera is on board a vessel, if a fire does start, using the camera for casualty location is also of paramount importance as passengers can become disoriented by smoke logged corridors and become unable to find their way to an area of safety. Thus, what was once considered an unnecessary investment has been transformed into a multi-functional tool that can become

motors, distribution panels and air conditioning ducting can be rapidly undertaken, as part of fire prevention schemes.

Finally, thermal imaging cameras have become widely used for tunnel fire fighting. In France and Italy, fire trucks utilising two driver cabins to eliminate having to turn trucks in tight tunnel environments have used thermal imaging cameras mounted at either end of the truck to help them navigate through the thickest smoke in an emergency situation.

Currently, due to increased competition in the market and technological advances in cameras, users are substantially better catered for than they ever were in the past. The most important aspects in making the right choice of camera, surrounds not only the initial cost of ownership, ergonomics and functionality specific to applications but the on-costs associated with day to day maintenance, consumables (such as batteries), reliability (in terms of the technology used) along with the warranty offered.

It has become obvious that the applications for thermal imaging cameras are extending and that the functionality offered on latest generation cameras facilitates this. Features and options offered on today's cameras, in addition to increased reliability and technological advances, make thermal imaging not only a wise choice but also a sound investment.

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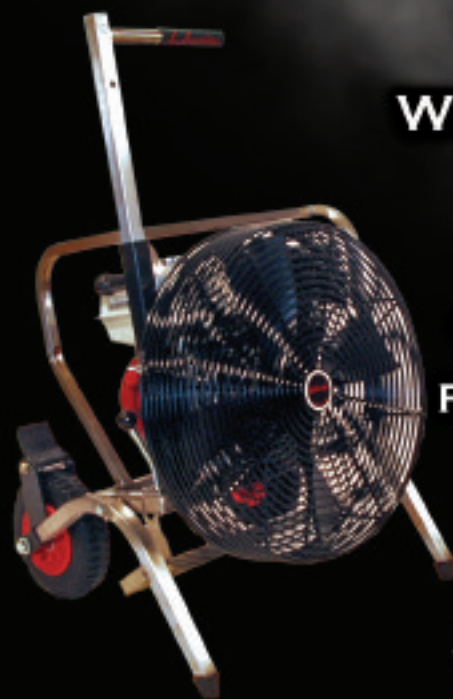
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OPS Lionheart – essence of the SCDF overseas rescue mission

Emergencies and disasters can occur anytime and anywhere. Hence, apart from responding annually to approximately 8,000 fire and rescue incidents, and 110,000 ambulance cases, the Singapore Civil Defence Force (SCDF) also deploys its “Operation Lionheart Contingent” to overseas rescue and humanitarian missions.

By MAJ Alvin Tan

Commander, Disaster Assistance and Rescue Team (DART)
Operations Dept, HQ
Singapore Civil Defence Force

Trained and equipped to conduct search and rescue operations, it has todate been dispatched to the following 10 missions:

- Baguio City earthquake, Philippines – Jul 1990
- Highland Towers collapse in Kuala Lumpur, Malaysia – Dec 1993
- Tai Chung County earthquake in Taiwan – Sep 1999
- Asia Tsunami Disaster, Aceh, Indonesia – Dec 2004
- Asia Tsunami Disaster, Khao Lak, Thailand – Dec 2004
- Sumatra Earthquake, Nias Island, Indonesia – Mar 2005
- Rokan Hilir Bush Fires, Sumatra, Indonesia – Aug 2005
- South Asian Earthquake, Muzaffarabad, Pakistan – Oct 2005

- Central Java Earthquake, Indonesia – May 2006
- Sichuan Earthquake, China – May 2008

The SCDF Ops Lionheart Contingent is multi-disciplined and self-sufficient. Deployable within short notice, it comprises 33 Disaster Assistance Rescue Team (DART) personnel and 22 other officers capable of providing specialist support in medical, technological communications, logistical and media relations. DART members are highly trained specialists of the SCDF tasked to undertake complex search and rescue operations. Their expertise includes high-rise and cliff rappelling, heli-borne rescues, tunnelling operations and other high-risk missions.

The contingent is equipped with a wide inventory of search, rescue and communications equipment, including fibre-optic scopes, life



detector systems and hydraulic cutters and spreaders. It also carries ration and fuel supplies for conducting a 2-week operation so that it would not exert additional burden on the host country already hit by a major crisis. The contingent is also equipped with search dogs trained to track and trace human casualties within rubbles at disaster sites.

The contingent was classified by the International Search and Rescue Advisory Group (INSARAG) as a 'Heavy USAR Team' after the INSARAG External Classification (IEC) in January 2008. It is first in Asia to receive this classification and seventh in the world. This classification system ensures that suitable rescue forces are sent to regional disasters in support of the United Nations Disaster Assessment and Coordination (UNDAC) Team. A "heavy" USAR team is recognized to have the capability to perform difficult technical search and rescue operations in structure collapse incidents. It is suitable for international deployment. A "medium" team is able to perform technical search and rescue operations in structure collapse incidents, but not those involving structures reinforced with structural steel. A "light" team can only assist with surface search and rescue in the immediate aftermath of a disaster.

Contingent structure

The Ops Lionheart contingent is built with two major functional components. Its operations function which includes search, rescue, evacuation, medical and other humanitarian services involves, DART Specialists, rescue engineers and medical officers led by the Contingent Commander. Its management function is administered by the Ops/Planning Officers, Info-Communication Officers, Media Officers and Logistics Officers. Their responsibilities cover planning, strategizing and monitoring the progress of operations at the incident site. They also manage liaison and coordination with

SCDF HQ in Singapore, as well as the local authorities at the incident site and the media present.

The Contingent Commander decides at the beginning of all operations how best to assign the USAR Specialists a work cycle that allows for adequate rest yet maintaining flexibility and resources to meet changing operational needs. He also ensures that there are sufficient reserve personnel to respond to unforeseen circumstances – an important strategic and safety consideration during any search and rescue operations.

Search and rescue considerations

USAR specialists need to have the ability to perform a wide variety of technical search and rescue operations. Therefore, one essential component of any USAR team is preparatory training. All SCDF DART Specialists undergo a 48-hr selection test before they are recruited to attend a 10-week rescue course. The course comprises 7 weeks of USAR, confined space, rope rescue training; and 3 weeks of medical training which equips the course participants with a Level 2 equivalent Paramedic competency. Such medical knowledge is important as most of the medical assessment during an incident is often made by one of the DART Specialists in the confined space or by a limited physical examination via imaging devices such as fiber-optic cameras.

Besides technical skills, SCDF DART Specialists are expected to operate specialized search equipment which include search cameras and acoustic listening devices which greatly assist in pinpointing trapped individuals in confined spaces or collapsed buildings.

Experience has shown that atmospheric conditions may be dangerous. Hazardous atmospheres include oxygen-deficient, flammable and toxic conditions. Before entering a confined space, the atmosphere should be properly tested with a gas detector. The use of sparking or electrical tools is extremely dangerous in such environments. Carbon monoxide may result from nearby fires and exhaust build-up from portable generators. There may be an accumulation of carbon dioxide exhaled by the casualty and the rescuers; and methane may be present from broken gas pipes. Considerations must also be given to the presence of hazardous materials found in the collapsed structure. If the environment is found to have unfavorable conditions, ventilation and oxygen supplementation is essential. Other safety measures include isolation of the hazardous materials and shutting off gas lines and electrical service.

SCDF DART Specialists also apply the INSARAG structural marking on collapsed structures. The marking will be placed near the point of entry on the exterior of the collapsed structure that offers the best visibility. Rescuers are trained to report all assessment results to the Contingent Commander immediately so that the information could be passed on to the Local Emergency Management Authority (LEMA) and On-Site Operations Coordination Centre (OSOCC). Besides confined spaces, certain rescue operations involve situations at different elevations. Rescuers are therefore trained in both confined space and rope rescue techniques. In order to maintain currency in both physical fitness and skills competency, all DART Specialists are required to pass 2 certification tests annually.

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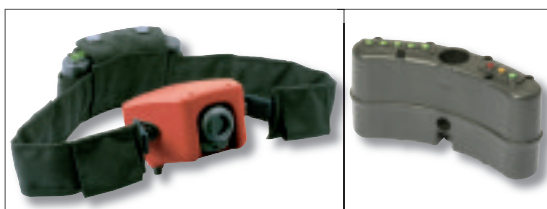
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Medical support

Prior to deployment to any overseas mission, all contingent members must be certified medically and have appropriate immunizations for working in the affected country. During any overseas mission, the Ops Lionheart Contingent is equipped with 1 doctor and 3 paramedics. They are able to provide an Advanced Life Support level of emergency medical care to both the contingent members and victims. They would also assist the DART Specialists, who are trained by veterinarians in basic health care of dogs, in providing health checks of the search dogs.

As a daily routine, it is important to monitor the team's nutrition and hydration needs; and ensure health and hygiene practices are strictly followed. Besides medical officers, the Contingent and Rescue Commander monitors the personnel for signs and symptoms of stress-related health problems and implement stress management techniques as appropriate. The Contingent Commander will also ensure injury follow-ups as well as short and long term stress management issues are addressed. A psychological debrief conducted by trained psychologist will be arranged for the contingent within seven days of return.

Logistics and communications

Logistics and Info-comm officers institutionalize, develop and maintain equipment, basic needs support and supplies plans, as well as set up effective local and international communications facilities. The Lionheart Contingent for instance is self-sufficient for 14-days. This is in line with the INSARAG Guidelines of 10-days self-adequacy. Sufficient quantities of food appropriate for entry into an affected country helps the contingent to sustain its overall health, performance and morale. Contingent members are provided with warm meals on a regular basis and fresh water (either bottled water or filtered water from open source). It is also important that rest, sanitation and hygiene provisions are made available during operations. For health and optimum rest, Lionheart Contingent members are provided with tents capable of protecting them from any harsh weather. The Logistics Officers also take charge of security and safety of the operations base. They take care to ensure safety practices are incorporated into the packaging, labeling and storing of equipment, and movement of personnel.

Effective communication is vital during operations. Efficient information exchange can result in better coordinated and safer USAR operations. SCDF ensures that its USAR teams maintain effective communication with each other throughout the operations, as well as with other actors within the theatre of operations and internationally with their home country headquarters. The Ops Lionheart Contingent utilizes the latest in technology and communication equipment. The Early Availability for Ground Leaders Evaluation (EAGLE) is a high-speed satellite communications system which allows for voice, data and video communications anywhere. This permits a quantum leap in remote communication capabilities between the HQ command elements and ground forces. Wireless



camera transmitter and receiver mounted on existing video camera allows for real-time transmission of on-going operations at the incident site so that commanders not at ground zero may still make informed decisions. The EAGLE was commissioned in 2006.

Media management

News crews these days hit incident sites fast. They ensure swift news coverage globally. The Lionheart Contingent has two media officers to front, coordinate and facilitate media activities. Their aim is to help support media needs at the incident site catering to both local and overseas audiences. They provide ready information about the structure and capabilities of the contingent as well as help organise media briefings and interviews.

Contingent Media Officers also receive copies of news reports published in Singapore. During breaks, they would share these coverages with the rest of their team members. This helps to keep the contingent members in touch with home news and serve to keep their morale high. The Media Officers also receive goodwill greetings from the families and friends of the contingent members. During Ops Lionheart missions, SCDF would set up a national "Ops Lionheart Website" where public can send in their well wishers and motivations.

Conclusion

The importance of timely, coordinated and technically sound international assistance provided in close coordination with the receiving country, in particular in the field of urban search and rescue, cannot be further emphasized. For humanitarian reasons, countries that have the capacity to provide such assistance should continue to do so, but measures must be taken to ensure maximum output for such operations and safety for the USAR teams deployed for the missions. Apart from the issues highlighted in this essay, guidelines of the INSARAG which provides internationally developed standards for the deployment and operation of international USAR teams should also be closely observed.

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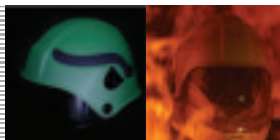
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Protecting Urban Search and Rescue Teams

By Richard Storey

for Bristol Uniforms Ltd

Whilst urban search and rescue has become increasingly associated with terrorist activity in the western world, although not by any means exclusively as the Bali bombings clearly demonstrated, in the eastern world, and particularly in the regions of the world bordering onto the Pacific Ocean, this type of rescue, more broadly termed technical rescue, is more frequently the result of natural disasters.

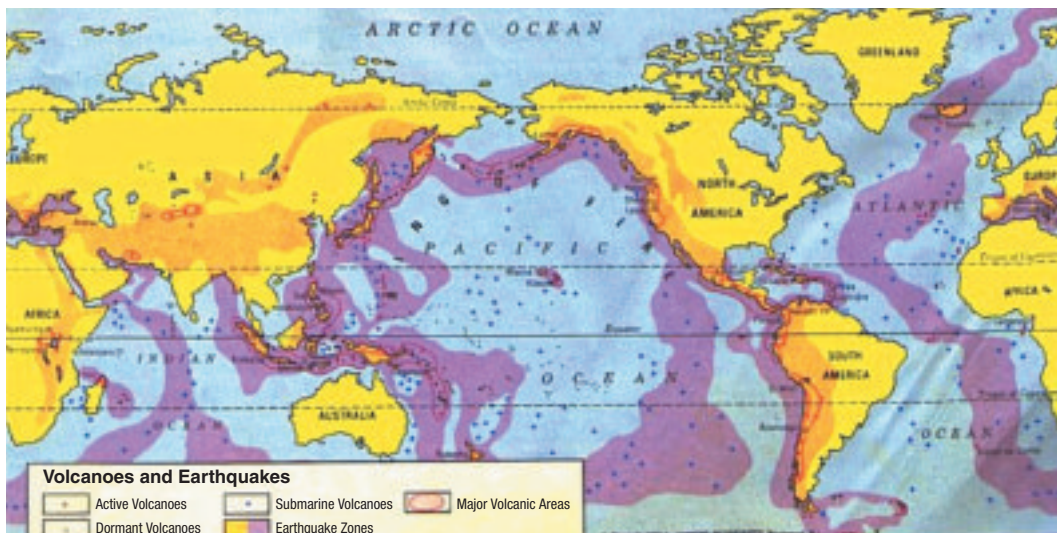
The Asia Pacific region is especially exposed to earthquake activity as many of the countries in the region lie along the Ring of Fire which runs up the eastern side of Australia, through the many islands of the South Pacific and up as far as Japan before crossing under the North Pacific Ocean and down its eastern edge along the entire coastal areas of North and South America. (see map)

Earthquakes stretching across Central and Southern Asia from Turkey through Iran to Bangladesh, Pakistan and India are also accompanied by tropical storms across the Indian sub-continent and up the Pacific Rim with further

damage periodically inflicted by Sunamis caused by under-ocean volcanic or earthquake activity.

In response to the particular hazards associated with technical rescue, the last 5 years has seen the development of specialist protective clothing for USAR teams to help meet the very different conditions they experience from their other role, in many countries, as firefighters.

Urban search and rescue is now considered to encompass incidents ranging from terrorist chemical, biological, radiological and nuclear (CBRN) attack to chemical spills, industrial, traffic and domestic accidents and building collapse. The term 'technical rescue' has a broader definition



and is used to cover the full range of natural disasters including floods, earthquakes, hurricanes and volcanic eruptions.

Recognising the health and safety benefits of specialist rescue PPE a number of Pacific Rim countries are now starting to adopt, or have under active consideration, the use of USAR PPE although its introduction can be delayed by funding considerations. Particularly in hot and humid climates, the benefits of lightweight clothing constructions add significantly to the reduction in wearer heat stress which can result from wearing heavyweight firefighter clothing in confined places

as well as in rescue missions involving road, rail or aircraft accidents away from airports.

USAR capability includes equipment to lift, cut and remove rubble from collapsed structures, and to locate casualties. It also brings with it the need to develop new skills including the ability to work in confined spaces, safe working at heights carrying out search and rescue operations in a multi-level collapsed building, technical search and shoring, breaking and breaching skills. Activities which include lifting and moving, using basic principles coupled with modern technology to move and stabilise heavy masses, place special



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stresses on the rescuer's body which in turn call for appropriate levels of protection and support whilst reducing heat stress to avoid early exhaustion.

The latest designs of USAR PPE incorporate fabric combinations which recognise the special conditions under which search and rescue personnel work and differ significantly from the makeup of structural firefighting ensembles which are still in USAR use with some fire & rescue services. The main differences are occasioned by the working conditions which, unlike firefighting, do not involve the presence of either fire or hosed water. Without the need for protection against flame and heat the outer fabric is selected more for its protection against physical damage and noxious fluids and chemicals. It also incorporates an inner membrane giving protection against rain, bodily fluids and pathogens.

The effect is to allow the USAR kit to become a two-layered construction affording much greater flexibility and wearer mobility and comfort in the confined and constricted working conditions frequently found in fire damaged and collapsed buildings. The lighterweight construction also helps to reduce internal heat build-up when working in hot and airless conditions often encountered in urban rescue situations. In the Bristol Uniforms offering the coat and trouser combination incorporates a 220gsm Nomex Ripstop outershell in Orange with a Gore Tex® Crosstech membrane. Easily identifiable at multi agency incidents the coat and trouser can be zipped together to give the advantages of a one-piece but retaining the flexibility of a two-piece garment. Other scenarios calling for USAR PPE include dealing with road traffic collisions (RTC) and rail accidents where the rescue crew is likely to be exposed to oil and fuel spillage, contamination from bodily fluids and the need to work in cramped conditions when entering badly damaged or crushed vehicles to help recover injured occupants.

As with coats and trousers, new designs for the other key elements of personal protection have been brought to the market in recent years. In







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particular, specialised boots, gloves and helmets are now available to provide protection against the hazards more commonly met during technical rescue missions.

Technical rescue boots should incorporate protection against the most commonly experienced hazards in technical or urban rescue environments and should be fully waterproof with a non-conductive sole, most probably in nitrile rubber, and a breathable inner layer such as a Gore-Tex® fleece lining. Technical performance characteristics would also include:

- Shock and compression resistance
- Hydrocarbon resistant soles
- Ability to dissipate an electrostatic charge
- Resistance to water penetration and absorption
- A metallic insole capable of providing the wearer with perforation protection
- Insulated soles giving protection from both heat and cold

Helmets in USAR environments differ from fire-fighting helmets mainly through being shorter at the sides so that the ears are exposed affording better hearing in cramped and enclosed situations where the members of the rescue team will not only be listening for signs of life where people are known to be trapped but also more aware of any dangers to themselves from further falling debris or collapse. Many are designed to be used with ear defenders when appropriate and have the facility for suspended goggles. The 'low profile' nature of technical rescue helmets makes working in confined spaces easier and would normally be expected to meet the requirements of NFPA 1951:2000 and EN 12492.

A good example would be the MSA Gallet F2 Xtrem® helmet. Gallet rescue mission helmets provide other benefits including:

- Three-point non-fire chinstrap with chincup
- Nomex or Pbi/Kevlar earlap for better neck and ear coverage and protection
- Foam cap to provide higher impact protection
- A SCBA interface adjustable front headband to accommodate any SCBA mask
- Removable washable cushion liners for greater comfort.

With accessories including a torch, mesh or clear visors, ear defenders, a neck curtain and a choice of osteo or micro communication systems.

Hand protection is focused on prevention of injuries such as punctures, cuts, abrasions and chemical spills. These protective qualities should be married to lightweight design capable of offering good levels of dexterity to handle specialised equipment. A good example would be the Southcombe USAR Glove with a tough Pyrohide® leather palm, thumb wrist pulls and across the back of the knuckles. Its other features include;

- A highly puncture, cut and tear resistant back made from an aramid antistatic fabric combined with a water and chemical resistant laminate
- Flame resistant neoprene coated Kevlar® roll-top finger and palm patches to provide abrasion and cut resistance
- A well-fitting knitted elastane cuff
- A seamless knitted lining of Kevlar® with glass fibre providing class leading cut resistance

PPE manufacturers, especially those in Europe and North America, have risen to the challenge of developing and introducing specialist protective clothing for the very varied and challenging environments in which technical rescue, and particularly USAR, teams are expected to work. In the UK, the London Fire Brigade, the third largest in the world, has recently taken delivery of Bristol Uniforms' USAR PPE for the 330 members of its dedicated USAR team. In addition, London has also chosen Bristol's managed care programme which will ensure that all the kit is regularly returned to Bristol for inspection, washing and repair as well as any decontamination which may be required. In this way the operational life of the garments will be extended ensuring that the investment made provides the best possible value.

Roger Startin, Bristol Uniforms' Joint Managing Director told *Asia Pacific Fire* magazine, 'The move to develop and provide technical rescue teams with more specialised PPE in recent years has been made possible by a combination of the availability of a range of new, high performance materials and fabrics and the PPE design capabilities in the UK from companies like Bristol whose international reputation for innovation in PPE is reflected in our presence in over 110 countries around the world'.

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Firefighting Foam: Making the Right Choice

By Dave Russell

Angus Fire

At a time when oil refineries, power-generation facilities, and transportation centres face increasing threats from fire, few things are more important to fire-fighters than their choice of foam.

They might think that the fire fighting performance of foam has now been relegated to a secondary status in foam selection criteria but fires involving hydrocarbon-based fuels and chemical-solvent products, which society increasingly depends on, are the most dangerous and difficult fires to fight.

Given the risks to health and property, this paper examines what emergency responders should consider when selecting foam without compromising the need for fire fighter safety.

Fire professionals cannot always predict the risk they face. Many fire and rescue services will have a major transportation hazard within their area, and at any time, who can know what is in transit? A wide spectrum of chemicals is in storage or is in use within chemical companies, the manufacturing industry, retail super stores, and bonded warehouses. Any incident will test the whole preplanning process, so fire-fighters deserve a high-performance fire fighting foam, one that will perform safely, quickly and securely against the

multifaceted risk. The priority is to protect the vital asset without compromising fire-fighter or public safety and to minimise the environmental impact of the incident itself and of the aftermath. It is reasonable to assume that safe, fast, effective suppression and extinction usually will achieve these objectives. What fire-fighters need is high-performance foam that can work safely and effectively across a range of risks, hence a clear need for a multipurpose foam.

What are multipurpose foams?

Multipurpose or alcohol-resistant foam is the foam agent of choice for dealing with fires and spills involving not only hydrocarbon-based flammable liquid products including biofuels but also a range of polar solvents. The alcohol-resistant nature of the foam gives it the multipurpose categorisation and allows it to work effectively on polar solvents. Polar solvents are by nature foam destructive, in that they absorb the water from the foam blanket and either stop any blanket formation at all or

rapidly break down the initial formation of blanket. They cover a range of foam destroying action from slight to severe. The following table provides a snapshot of this spectrum:

Foam Destroying Action
Slight Amyl Acetate, Butyl Acetate, Ethyl Acetate, Methyl Isobutyl Ketone, Di-isobutyl Ketone, Methyl Tertiary Butyl Ether, Cyclohexanone, Cyclohexanol, Pentanol, Ethane Diol, Ethylene Diamine, Monoethylene Glycol, Vegetable Turpentine.
Moderate Acrylonitrile, Acetone, N-Butanol, Iso-Butanol, Tertiary Butyl Alcohol, Methanol, Ethanol, Iso-Propanol, Industrial Methylated Spirits, Dimethyl Formamide, Ethyl Lactate, Ethylene Glycol Monobutyl Ether, Diethylamine, Cyclohexylamine, Diethyl Ether, Trimethylchlorosilane,
Severe Ethylamine, Isopropylamine, Acetic Acid, Propylene Oxide

Users have also to consider the correct application rate to select, depending on the aggressive nature of the polar solvent. Much of the test work completed so far on the various biofuel blends emphasizes the need for the selection of high-performance, alcohol resistant foam. Whatever the blend, it seems that the resulting “cocktail” not only accentuates the volatile nature of the hydrocarbon but also increases the foam-destructive nature of the ethanol, even in small % mixes of ethanol.

Multipurpose fire fighting foams divide into two basic categories. The protein-based category, film forming fluoroprotein foam, is alcohol resistant and is usually abbreviated to AR-FFFP. The second category is synthetic-detergent-based foam, described as aqueous film forming foam that is alcohol resistant. This is known as AR-AFFF. Both types will exhibit certain distinctly different characteristics in use. Typically the good quality AR-FFFPs will be less toxic than the synthetic detergent-based AR-AFFFs and often provide a higher degree of post fire security.

Multi-purpose foams will also have a manufacturer’s recommended % induction for use on hydrocarbon and what % use for polar solvents. The foam title should confirm these recommendations. Typically these would be:

Title	Recommended Induction
3-6 Concentrate	Use at 3% on hydrocarbon fires and 6% on polar solvent fires
3-3 Concentrate	Use at 3% on hydrocarbon fires and 3% on polar solvent fires
1-3 Concentrate	Use at 1% on hydrocarbon fires and 3% on polar solvent fires

How is alcohol resistance achieved in fire-fighting foams?

Typically this was achieved by introducing foams that contained a water soluble polymer of the



polysaccharide type that came out of solution when brought into contact with polar-solvent flammable liquids. This led to the formation of a skin-like barrier on the surface of the polar solvent that physically separated it from the destructive polar solvent. Today, polymer-based alcohol resistant (AR) versions of aqueous film-forming foams (AR-AFFF) and the film-forming fluoroprotein (AR-FFFP) foams are used worldwide. The film-forming capability means that it forms a thin aqueous film on hydrocarbons that races ahead of the foam blanket to give rapid extinguishment. It is also specially formulated to protect fire crews by preventing sudden reignition and burnback.

A problem sometimes encountered with polymer based AR foams, particularly those products at the lower quality end of the market, is high viscosity. This means that some of them can be thick and sticky, which in turn can lead to blockages and proportioning problems.

Foam concentrates that are suitable for use on hydrocarbons only, such as FFFP and AFFF, are classified as “Newtonian”. In other words, they display constant viscosity at different shear rates. However, polymer-based AR foam concentrates are classified as “Non-Newtonian” because they display different viscosities at different shear rates. Most Non-Newtonian foams display decreasing viscosity with increasing shear rate, which is known as “Pseudoplastic” or “Shear-Thinning”. Such viscosity complications are not exhibited by the latest AR foams, such as Niagara from Angus Fire. This is because polymer is not used to achieve alcohol resistance. Its advanced “polymer free” formulation works on polar solvents by an alternative mechanism of effectively giving each bubble its own chemical suit! The resulting “high fluidity” foam is easy to pour from drums; it flows freely through pumps, pipe work and vehicle proportioners; and it provides accurate proportioning in all weather conditions.



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What other issues need attention in selecting multi purpose foam?

Clearly we have covered the need for understanding and selecting a fire fighting foam that delivers high operational performance in swift and safe extinction, and we have shown how this is achieved. But what other considerations are critical in foam selection?

Trouble-free storage

Another advantage of polymer-free foam is superior storage stability. Some of the more viscous polymer-based AR-AFFF foams have often demonstrated storage problems. If such foams are not manufactured properly, there is a risk that the polymer will come out of solution to form a gel when subjected to extremes of temperature during long-term storage. Most polymer-based AR-FFFP foams have lower levels of polymer and so are much more stable in storage.

The latest AR foams do not suffer this problem at all because they do not contain any polymer. They can be relied on to have a shelf-life of at least 10 years.

Versatile in application

AR foam must also be suitable for use through various foam-making equipment, including non-aspirating hand-held water nozzles, low-expansion foam branchpipes and monitors, and medium-expansion bund pourers. Modern products are also available in 3-3 and 1-3 grades, which are proving very popular with fire services because they are economical.

Low environmental impact

Polymer-free AR-FFFP uses the latest environmental technology. Its main ingredient is natural protein that is not ecotoxic and is readily biodegradable. It contains none of the chemicals that have led to environmental problems with other types of foam, such as PFOS, detergent and glycol ethers. As with any type of modern high-performance operational foam, it contains fluorotelomer based compounds.

Concerns about the effects of these key ingredients on the environment have led foam manufacturers to develop Fluorine Free Foam (F3). While F3 foams should not be selected for operational use, they are ideal for vehicle testing and foam training exercises.

After sales support services

Whichever type of AR foam you use, it is important that it be manufactured under strict manufacturing quality control in a dependently assessed facility that is in full compliance with BS EN ISO 9001:2000. The performance of the product itself should be independently approved by Underwriters Laboratories Inc., which ensures not only original compliance but also ongoing quality during annual audit. Regular testing is advisable to ensure that it is still fit for purpose. This is particularly important for polymer-based AR-AFFF type foams. Finally, all international experience has shown that it is critical to partner with a foam supplier that has a proven record of urgently delivering large volumes of support stocks of foam to responders at major incident sites worldwide. At times like this, mutual aid and a partnership with dedicated foam manufacturer is essential.

Fire-fighters' need for multipurpose foam is widely accepted, but what is increasingly challenged is their need for high-performance multipurpose foam. Even the majority of environmental technical reviews of foam selection concede that there remains an operational need to retain higher-performance fluorotelomer-based foams for large flammable liquid-tank fires. It appears that some people are increasingly willing to compromise fire-fighter safety, fire-extinction performance and efficiency. This is a dangerous trend and, given the scale of the challenge, totally unacceptable for fire-fighters and those with a duty to ensure their safety. An environmentally responsible balance can still be achieved by selecting a fluorotelomer based multipurpose foam with unrivalled performance and by purchasing it from a dedicated, responsible, specialist foam manufacturers. **APF**

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Nightsan Light Tower Product Line. Pic courtesy of Towermast, a Will-Burt Company



The Importance of Large Area Scene Lighting

By Angie Lamielle

Marketing
Communications
Specialist,
Will-Burt Company

Safety is always a top priority for emergency services personnel. When crews are called to a scene during night time hours, safety becomes a more difficult issue to overcome due to a lack of visibility. To do a job safely at night, the best scene lighting possible is critical.

Telescopically light towers are necessary for illuminating the scene during night rescue, command and control and disaster operations. Emergency services personnel have two options available to them to increase visibility at the scene: vehicle-mounted light towers and portable light towers.

Vehicle-mounted light towers

Telescoping light towers are the optimal way to meet the needs of night time operations, allowing crews to benefit from full scene coverage. Vehicle-mounted light towers are either pneumatic or manually operated. Manual operation requires the operator to “push-up” the tower and manually adjust the direction of the light. Pneumatic telescoping light towers come standard with hand-held remote controls. This allows for quick, precise operation, giving the operator more time to attend to other important functions at the emergency scene.

Mounted to a fire rescue truck, mobile command center or other emergency services vehicle, a critical item to be determined before purchase is how and where the light tower will be mounted. A light tower can be mounted inside the vehicle, outside the vehicle or on the vehicle roof. Where the tower is mounted largely depends on the size of the vehicle and what other accessories are on the vehicle.

Another important consideration when purchasing a pneumatic telescoping light tower is the size of generator that the vehicle is equipped with. The main concern when purchasing a generator is to ensure the vehicle has enough power to run the lights efficiently.

With varying terrain and operational needs, it is also important to specify the height of the telescoping system. Systems can be installed that are upwards of 12 meters.

Internal mounting

An inside mounting is perfect for a mobile command center or large rescue vehicle. The internal mounting nests the retracted mast inside the vehicle with the light package nested on the roof. The internal mounting provides maximum stability for a vertical light tower with full extension up to 12 meters. Standard kits are available with the light tower itself to assist in mounting internally. If extra space is a problem in the vehicle, there are options available for external mounting as well as roof-mounted configurations.

External mounting

The external mounting works well when maximum extension is necessary but there is not space on the inside the emergency vehicle or on the vehicle's roof. External mountings can be on the rear or side of the apparatus or command center. Many emergency vehicle manufacturers build custom covers that enclose the externally mounted light tower for protection and appearance.

Roof mounting

Roof-mounted light towers save compartment space inside the emergency vehicle. A roof-mounted light tower is mounted on the roof of the cab or within compartment on the truck body. This allows the light tower to stay at or below the roofline of



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the vehicle when retracted. The consideration when specifying a roof-mounted tower is to ensure there is enough roof space on the apparatus. The roof compartment should be specified large enough to accommodate the light tower required.

Important options for a vehicle-mounted light tower

Lights

Critical when specifying a light tower, is how much light is necessary. There are many companies that offer lighting packages specifically designed for use in the emergency services field. With many options for lighting packages including quartz halogen, metal halide and H.I.D., a custom system can be configured for the illumination necessary to function properly at night. Light towers can have up to 9000 watts of AC lighting or up to 600 watts of DC lighting.

Generators

All light towers need a source of power. This electrical source can come from different places. If tower's lights are DC (Direct Current) they get power from the vehicles electrical system or primarily the alternator.

Larger wattage lights need AC (Alternating Current) source that that is provided by a generator, but generators need power as well. The most common generator power comes from the vehicles engine in the way of the Power Take Off (PTO). Some use a direct shaft PTO that spins the generator directly from the drive train. Others use the PTO to drive a hydraulic pump that, in turn, drives the generator.

Lastly, your can have a generator that is powered by a standalone engine. This allows the vehicles to be turned off and the generator to run independent of the vehicle.

Remote controls

A hand-held remote control attached by a coiled cord is typically standard with the purchase of the light tower. Because pneumatic light towers are operated by a remote control, this allows the operator to attend to other important functions at the emergency scene. It can be very time consuming to manually raise the light tower and adjust the lights. A remote control allows the operator to quickly control all functions of the light tower with the simple press of a button to properly position the lights to provide optimal illumination.

Some manufacturers also offer wireless options to increase flexibility at the emergency scene



Nightscan Roof-Mounted Light Tower. Pic courtesy of Towermast, a Will-Burt Company

allowing the operator to be much farther away from the vehicle than with the wired remote control.

Panel mount controls are also an option. A panel mount control offers the flexibility of operating any light tower from anywhere on the apparatus or incident command vehicle, including the pump panel of a fire truck. The panel mount control can be added as an option along with the hand held remote control or in place of the hand held remote.

Remote control positioner

A light fixture positioner integrates solid-state circuitry to provide full rotation and tilt capability for the attached light fixtures on the tower. This allows the operator to precisely point the lights in any direction to illuminate a rescue scene, fire, ground or other work area.

Dual-tilting feature

Dual-tilting is a very important accessory to add to the light tower. Dual-tilting allows the bank of lights on each side of the light tower to shine independent of one another. This ensures the maximum scene illumination possible during an emergency operation allowing the operator to shine the lights in two different directions at once.

Obstacle detection

Some manufacturers offer obstacle and electrical power line detection equipment as an add-on for the light tower. These obstacle detection systems are mounted directly on top of the light tower and prevent the tower from colliding with any overhead obstruction. These systems offer power line detection, object proximity detection, tilt sensor

detection, and above the light tower illumination.

Portable light towers

Portable light towers offer mobility and flexibility at the emergency scene. Portable light towers are light weight and can be quickly deployed. Since most manufacturers offer carrying bags with the equipment, emergency crews can carry the light tower and deploy it virtually anywhere.

Another benefit of the portable light tower is that it can remain at the scene as long as needed without fire department support. If a police squad is needed to stay longer for clean up or investigation, a portable lighting system does not require vehicle support.

Camera accessories

Today, emergency scene management and safety are greatly enhanced with the addition of cameras for monitoring, recording and surveillance. Some manufacturers are now offering camera mountings to their telescoping mast product lines or as an accessory to add on to a light tower.

Cameras can provide a unique perspective of the emergency scene and with zoom capabilities, personnel on the ground can survey the scene quickly and efficiently. Cameras also provide real-time monitoring and provide accurate records and documentation. **APF**



Mobilemast Portable Mast with Lights. Pic courtesy of Towermast, a Will-Burt Company



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The essential role glazing in modern



No-one seeing this year's impressive Olympic spectacle in Beijing, nor watching the preparations for the next in London in 2012, can fail to be aware of the fundamental importance of the modern built environment for nations and communities. Buildings provide the setting and backdrop for daily lives. They are valuable assets that provide the critical foundation for economic development in so many ways, encouraging growth, prosperity, diversity, culture, and community sustainability as a focus for commercial development.

By Mike Wood

Pilkington

One of the greatest threats to that foundation is posed by the threat of fire, especially in modern congested cities where there is such a premium on space. Modern architecture has come to depend on glass to produce eye catching and efficient, comfortable buildings. It should be no surprise, therefore, that fire resistant glass is now such an important feature and a critical element in effective fire safety design strategies.

The importance of regulation and standards

As the buildings go up and cities grow beyond their boundaries, so does fire protection regulation and control come increasingly under a spotlight. In parts of the Asia-Pacific region, fire comes perhaps only second to protection against earthquakes in terms of securing the built environment for the future in what are becoming massive, congested

urban areas. Not only are people's lives at risk. Public investment, valuable assets and community wellbeing can simply be wiped out in a few hours of catastrophic fire development. The modern world cannot afford to be careless about fire. Nevertheless, that too often turns out to be the case.

Part of the role of regulations and standards is to focus on that threat, to draw attention to the destructiveness of fire, and its unpredictability, so that adequate measures to protect against it are taken when the building is first designed and then constructed. Built-in protective measures are the best, to be there from the beginning as part of the building itself. That's why fire safety starts with regulation and supporting standards.

Development of regulations

It isn't straightforward to develop regulations from scratch, without a history of development. Ideally,

of fire-resistant designs

regulations and standards should grow with the built environment. The best examples of fire regulation are where the requirements have evolved in line with the evolution in urban architecture, usually triggered by landmark fire events. Particular examples which have led to a tradition of fire protection in construction are the Great Fire of London in 1666 and the Great Fire of Chicago in 1871 which laid the basis for the basic fireproof structure of buildings which has evolved today in so many of the world's iconic skyscrapers.

But, that tradition is not easy to establish when economic development is particularly rapid. Sometimes the regulations have to play catch up. But then the pace of change will in turn have to be fast, adaptable to developments in the urban environment, in parallel with the latest architectural design and use of materials in construction.

For example, the first standard in China for fire-resistant glass (GB 15763) dates from 1995, with a major revision in 2001 by the glass studies department of the China Building Material Technology Institute. Door and window systems have a separate standard, GB 16809-1997. The level of interest can also be seen from the high degree of involvement by the academic and technical community in the active research and conference programmes on the fundamentals of fire behaviour. The code for fire protection in building design (GBJ16-870) was created in 1987, modified in 1997, and revised in 2001. Similarly, codes were developed for high-rise buildings (GB 50045, recent version 2003) together with norms and specification guidelines covering partition walls and interior decoration: GB 5022-1995, GB 50222-1995, and GA97-1995. These codes are even now under review. The need for specific and focused regulatory guidance is rising.

Global regulations?

Much does go back to historical roots. There are some common patterns around the world and an increasing tendency to see common solutions especially as globalisation takes greater hold. Certainly, the modern international style of skyscraper and high rise public building is fundamentally the same in London and Chicago as it is in Hong Kong and Mumbai. Product technologies and design solutions are replicated around the globe and international architects and engineers move easily from city to city.

The underpinning principles of fire protection should also be common. But, there are real risks of being misled if we try to copy regulations and standards and make them the same the world over. There should be sensitivity to local conditions, traditions, and circumstance. The individual and local dimension needs to be taken into account as well. Travel and response time is likely to be very different in a traffic locked city such as Taipei, Bangkok or Mumbai compared with Berlin



or Chicago. Such considerations are likely accordingly to lead to different levels of required fire resistance in buildings.

It is understandable, for example, that the almost total destruction of a city in the prefecture of Akita in 1978 caused regulators in Japan to think about stopping fire movement from one building to the next by using better fire-resistant products and constructions. The tendency in the US and Europe is to concentrate more on containing fire within the building and on getting people out to a place of relative safety as fast as possible. If we consider the huge premium on space in Japan, the use of timber and the need for buildings to be close together then it is understandable why so much of the fire glazing in Japan is traditionally in external applications and why the fire-resistant glazing is such a practical and robust product such as polished wired glass.

Risk based design

Fire safety design has to be tailored to suit the local conditions, the individual building design and its purpose. This has increasingly given rise to an individualistic design approach based on an evaluation of risk. The answer lies in design tailored to the individual building needs to match the use of the building and the characteristic profile of the people using the building. For example, revision of building regulations in Japan in June 1998 led to a significant introduction of such performance-based guidance.

The cultural centre and arts complex in Sendai, seven floors of each of area 21,654 sq m, exemplifies in one building the application of performance-based design. Openness, vision and

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transparency are essential design elements. So, more than 3,400 sq m of fire-resistant glass are used throughout the building, giving the building a distinctive style and atmosphere. Fire-resistant glass is used in a remarkable innovative way to enclose the supporting structural and service tubes stretching from top to bottom through each of the floors in turn. The whole interior of the building on each floor is therefore opened up in a remarkable manner. This is not only important for the general utility and functional value of the building. People in case of emergency like to have an awareness of their surroundings and move more easily towards the light when they need to get out of the building in case of fire.

Fire-resistant glazing

Three different types of fire-resistant glass are used in the Sendai building – standard wired glass, modified special toughened glass (Pilkington Pyroclear), and high performance integrity with insulation intumescent glass (Pilkington Pyrostop). Pyrostop is based on the tried, well tested and trusted Pilkington proprietary intumescent interlayer to produce a range of robust and resilient composite laminates which can, if necessary, face up to a high intensity fire condition. It has been in successful use now for more than thirty years. When exposed to fire, the intumescent interlayer foams and turns opaque, protecting not only against smoke, fume and flame, but also against the heat from the fire by all transfer mechanisms. Both 30 minute and 60 minute rated Pyrostop varieties are used in the Sendai project.

Where the different glass types are used depends on the working environment, required function, area of application and especially the potential fire load. That's the essence of performance based design, founded on a consideration of the fire risk in the application, leading to a consideration of the required function of the fire-resistant glass. In the Sendai project, for example, Pilkington Pyrostop 30 minutes insulation is used for important locations around the supporting tubes, as well as around the main stairs that link all the floors, where a higher level of protection would be anticipated from increased temperatures. On the library floor at the third level, the specification throughout is upgraded to 60 minute Pyrostop because of the inherently higher fire load on that floor. The wired and Pyroclear applications are on other floors where the fire loads are much lower and where the level of occupancy is lower.

Risks of risk-based design

The potential downside for the performance-based, non prescriptive approach to fire safety design is the threat to consistency. The approach depends on expert knowledge. Therefore individual background, awareness, knowledge, perceptions and goals may all influence the derived solution.

Modern materials, products and constructions are complex. Fire sets many challenges because it is potentially fierce and unpredictable. It is therefore critical for the designer and specifier to have a close knowledge of how products react and behave towards fire. It is important to take a wider view on material performance and to consider the performance of the whole integrated structure rather than individual elements.



Product considerations

Not all fire-resistant products are the same, even if they are part of the same nominal product specification and fire resistance class. Testing for the classification of fire-resistant products is important. But for performance-based design, where a value judgment has to be made on the potential risk

subject to the likely fire environment, it is more important to know the mechanism of failure and deterioration. The track record, standing and reputation of the manufacturer are also very significant.

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toughened fire-resistant glass types cannot be assumed to be the same. Each proprietary toughened glass should be evaluated separately and weighed in judgment rather carefully. Failure, if it happens, is total and unpredictable, forming a pile of glass pieces. There will be no warning of the failure of toughened glass. But one toughened product is different from the next. The probability of catastrophic failure is likely to vary from product to product, possibly from batch to batch. Framing can also be critical. Performance is critically dependent on the quality of production and even on the transport and handling history of each glass piece. Some are more sensitive to fire than others.

Performance-based designers need to be aware of this tendency, and therefore to be careful about the product that is specified as well as the area of use, the anticipated fire condition, and the criticality of the application for life safety and protection of the building from major fire exposure.

The importance of quality technology

Manufacturers and suppliers need to understand these factors. Fire is typically unpredictable and capable of springing surprises. So, detailed considerations have been given to the development of Pilkington Pyroclear, which is a high quality super modified toughened glass for fire resistant applications.

The secrets of how to reduce the risk of failure to an absolute minimum have been well defined and understood through dedicated research and development work over years, independently carried out in both Japan and the UK technical centres, backed up by extensive testing. The results can be seen in the precise specification of all aspects of the product, the attention to control in manufacture, and the care taken in subsequent handling and transport. Pilkington Pyroclear is not like other modified toughened products: it is the only glass of its type to have a special engineered edge, protected by special edge tape, to be manufactured using bespoke toughening and edging equipment, using the latest technology for consistency, specifically designed, specified and manufactured to order for this particular product, and no other.

Other types – intumescent laminates

The tremendous benefit of the intumescent laminate structure is that the whole composite functions as a unity in case of fire. The intumescent interlayer is compatible with glass, bonds to it, and produces a resilient and robust barrier against fire. Not only is this barrier effective in keeping back flames and smoke, but it also functions as a heat shield. The interlayer is refractory and the mode of deterioration only slow and progressive. Performance is therefore predictable and controllable.

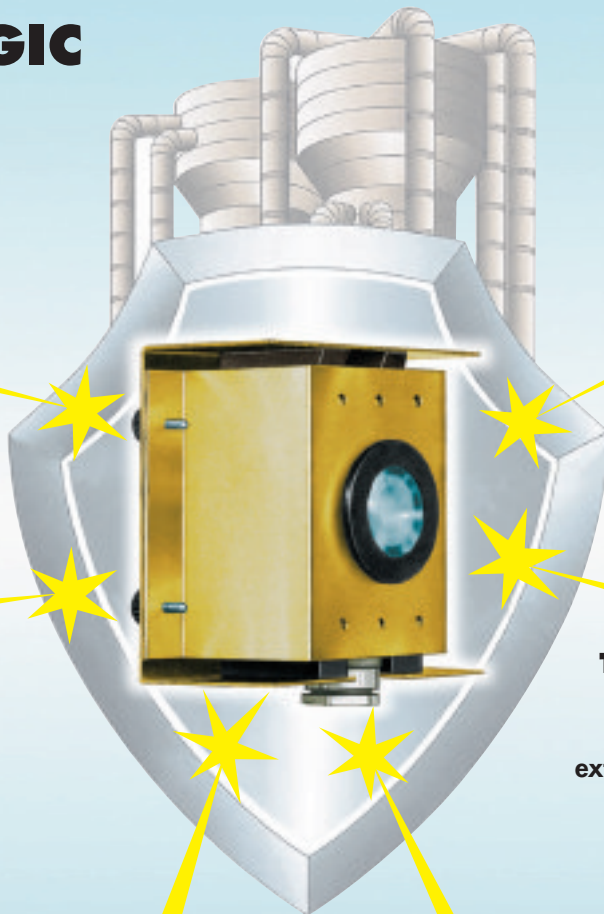
A wide performance range and high levels of performance can be readily achieved in Pilkington Pyrostop simply by replicating the laminate layers. Integrity and insulation classifications of 30, 60, 90, 120 and even 180 minutes can be achieved. And applications include horizontal as well as inclined and vertical applications, also including insulating fire-resistant load bearing glass floors. As repeat testing for hundreds of times and practical fire exposure demonstrate, the insulation performance is consistent, repeatable, and reproducible. It provides a gutsy, no nonsense performance. The lower inherent risks for such a technology therefore allow a wide range of application under a wide range of fire conditions, for both life and property protection, especially when there is a major uncertainty surrounding potential fire exposure or in more demanding buildings and areas of application where the consequences of failure may be more critically demanding.

Focus on product

Flexible performance based fire safety design has an increasing role to play as cities and buildings become more complex and more valuable. That requires an evaluation of the varied risks that apply in fire which in turn leads to a concentration on individual product, its technology and quality of performance. Product pedigree is potentially critical and attention to detail on the product quality of performance in fire is essential. And that is being increasingly recognised the world over in regulations and standards for fire safety, and in the practice of fire safety design, all of which continue to evolve in line with the demands set by the hazards of fire.

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International De Fixed Fire Suppr

Picture showing two trucks involved in the initial crash and fires in the Burnley incident. Note lack of damage to trucks, road surface and surrounding tunnel. Pic courtesy of the Herald Sun Newspaper



**By Professor
Arnold Dix**

The Burnley Tunnel incidents of 23 March 2007 focused the World's attention on the effectiveness of fixed fire fighting systems ("FFFS") as a tool for protecting both human life and tunnel infrastructure. FFFS are, in effect, mandated in congested tunnels in Japan¹ and Australia.²

Until 2007 the peak western world standards on tunnel safety such as PIARC and NFPA 502 were either silent or actively counselling against the use of FFFS for life protection. FFFS have become an *acceptable* option for managing fire risks in tunnels around the world – at least in part because of the author's personal commitment to updating world standards.

This situation changed with fixed suppression systems now recognised as an option in the latest PIARC and NFPA 502 publications.³

The Burnley event is in contrast to other major

world incidents – including the Mont Blanc, Tauern, Gotthard, and Fréjus tunnel fires as the fire growth in the Burnley incident was contained by the use of FFFS. The table below summarises what can occur in a road tunnel fires.

Japan has over 40 years FFFS experience. There and in the recent Burnley incident, the rates of injury and damage to infrastructure have been, by comparison with European incidents,⁴ small with only minor infrastructure damage and almost no significant fire spread or injury to tunnel users not involved in the initial crashes and fires. Japan⁵ and Australia have FFFS.

Accident, year	Road tunnels	Vehicle type	Estimated peak HRR(MW)	Estimated fire duration	Number of fatalities
1999	Mont Blanc	15 trucks, 9 cars *	300-380	9-13 h	39
1999	Tauern	16 trucks, 24 cars	300-400	7-10 h	12
2001	St Gotthard	13 trucks, 10 cars	>200	3-4 h	11
2005	Frejus tunnel	4 trucks, 3 fire fighting vehicles	>200	<6 h	2
2007	Burnley Tunnel	2 trucks, 3 cars	10 – 30	1 h	3

developments in ession systems

PIARC on fixed fire fighting systems – a short history

In PIARC's report to the Brussels World Road Congress in 1983.⁶ PIARC identified the following problems with fixed fire fighting systems:

- Water can disperse burning petrol
- With some materials contact with water can produce dangerous reactions
- The steam which is produced can reduce visibility
- Even if the flames are extinguished, the metal in the vehicle does not cool quickly
- Petrol continues to vaporize and may produce an explosive mixture
- Hot surfaces may ignite vaporising petrol or LPG gas

In view of these adverse and even dangerous factors the installation of sprinklers was not recommended in road tunnels.

PIARC concluded that:

"given our present knowledge of the subject the use of sprinkler systems in road tunnels is not recommended for the following reasons:

- *The water can result in the dispersion of burning liquids over a large surface area*

hazardous cargo may have some form of sprinkler. The reasons most countries do not use sprinklers in tunnels, is that most fires start in the motor room or in the compartment, and sprinklers are of no use till the fire is open. Sprinklers can be used, however, to cool down vehicles, to stop the fire from spreading to other vehicles (i.e., to diminish the fire area and property damage) and to stop secondary fires in lining materials. Experiences from Japan show that sprinklers are effective in cooling down the area round the fire, so that fire fighting can be more effective."

In 1999 PIARC⁹ summarized the problems with sprinklers as follows:

- *"water can cause explosion in petrol and other chemical substances if not combined with for example Aqueous Film Forming Foam (AFFF);*
- *vaporized steam can cause damage to people;*
- *the efficiency is low for fires inside vehicles;*
- *the smoke layer is cooled down and may cover the whole tunnel;*
- *maintenance can be costly;*
- *sprinklers are difficult to handle manually;*

PIARC is currently updating its 2008 report by conducting a detailed review of both experimental and actual field data. Furthermore the design fire research group is exploring the impact of these systems on fire growth.

- *Water can cause dangerous reactions when it comes into contact with certain products*
- *Even if the flames are extinguished the metal parts of the vehicles do not cool very quickly*
- *Flammable products can continue to give off gases leading to the presence of explosive mixture*
- *The water (or foam) that is distributed may, as in the case of the Velsen Tunnel in Holland, be insufficient to extinguish the fire on a vehicles carrying a large quantity of fuel"*

At the Montreal World Congress in 1992⁷ PIARC again concluded that:

'sprinkler systems are not recommended in road tunnels'.

In 1999 by way of the publication, 'Fire and smoke control in road tunnels'⁸ PIARC's position softened.

"No European countries use sprinklers on a regular basis. For some tunnels in Europe sprinklers have been used for special purposes. In Japan sprinklers are used in tunnels longer than 1,000 metres to cool down vehicles on fire. In the United States only tunnels carrying

- *sprinklers should not be used in the fire area before all people are evacuated;*
- *automatic sprinklers can pose difficulties for fire fighting."*

Accordingly PIARC weakened its positions concluding that:

*"the working group **will normally not recommend sprinklers for ordinary fire fighting.** Sprinklers in tunnels are primarily used to protect the tunnel structure not the motorists. Sprinklers can also be used, where appropriate, in ancillary rooms in tunnels and tunnel facilities."*

In 2007 PIARC, in its publication, "Systems and equipment for fire and smoke control in road tunnels",¹⁰ PIARC concluded:

"at the moment, an owner/operator who wants to install new detection and new fire fighting measures must properly verify that the conditions for installing, using and maintaining contribute to the overall safety and are compatible with the framework of the entire safety concept for that specific tunnel. He must also ensure the effectiveness of the proposed measures."

Tauern Tunnel fire 1999 with no means to suppress the initial fire it rapidly grew and spread from car to car over hundred of metres causing extensive damage to infrastructure and injury to users



Most recently PIARC in its 2008 publication "Road tunnels: an assessment of fixed fire fighting systems"¹¹ notes

"...a FFFS should only proceed where its ongoing performance is assured through a systems engineering approach to tunnel safety along with a firm commitment to provide the necessary maintenance"

PIARC is currently updating its 2008 report by conducting a detailed review of both experimental and actual field data. Furthermore the design fire research group is exploring the impact of these systems on fire growth. These will be the next reports from PIARC examining this subject. FFFS will remain a PIARC endorsed option for safety and asset protection of road tunnels.

NFPA 502

NFPA 502 Standard for Road Tunnels, Bridges and Other Limited Access Highways has in its 2008 edition¹² excepted that fixed fire fighting systems can be effective in controlling vehicle fires in road

From both corporate governance and professional negligence perspective failure to *consider* the use of such systems may constitute evidence of either unprofessional conduct or potentially criminal conduct in the event that fires cause fatalities and/or significant damage to infrastructure.

However the inclusion of these suppression systems in the standards neither makes their installation compulsory nor mandates their use (even when installed) in a fire.

There are a range of valid reasons not to use such systems. Issues associated with their use – such as destratification of smoke – are extremely important to recognize and appropriately manage. It is essential to explore and manage these aspects of their performance in order to appropriately consider their use – and where appropriate integrate them in the tunnel safety systems.

New technology – new challenges

The inclusion of FFFS does not of itself create safe tunnels. The maintenance of a fire suppression system does not mean that the system will operate, and the use of fire suppression does not guarantee that it will work. Such systems, if they are to be relied upon, demand an ongoing and systematic approach to their successful operation in the unlikely event of a fire.

Arguments that such systems should allow a reduction in the level of fire protection and other safety systems highlight the importance that such FFFS actually work when and incident occurs. The design fires to be used in such tunnels remains contentious due to the FFFS impact on factors such as fire growth, fire spread and smoke behaviour.

The inclusion of FFFS does not of itself create safe tunnels. The maintenance of a fire suppression system does not mean that the system will operate, and the use of fire suppression does not guarantee that it will work.

tunnels by limiting the spread of the fire, reducing the temperature of surrounding air and surfaces, and reducing the fire heat release rate.

Like PIARC, NFPA 502 had previously¹³ resisted endorsing the use of such systems for reasons including:

- the systems inability to extinguish fires within motor components
- the production of super heated steam
- destratification of toxic gas and smoke
- risk of tunnel users thinking spraying water was as a result of tunnel structural failure
- the costs of maintenance.

Each of these concerns has been the subject of specific consideration and proposed mitigation strategies in the latest edition of NFPA 502.

Significance of international changes

These changes to standards squarely raise the potential for fixed FFFS to be used in road tunnels and in accordance with international standards.

FFFS necessarily adds expense to some aspects of a project as they require ongoing maintenance, must be operated effectively (correct location and in a timely manner) and must be integrated within other safe tunnel safety systems. However a FFFS may also be used as part of a design fire reduction rationale in some circumstances.

Accordingly, the process of determining that such a suppression system is required must be coupled with a very clear understanding of what it is that the suppression system is designed to achieve and how achieving that performance outcome will be assured.

Traffic suppression system interface

To operate effectively an FFFS must be designed, installed and maintained, and the operator must be able to activate it correctly and it must survive the events which have resulted in the incident requiring its activation.

These threats can be divided into two types.

One is physical (through mechanical collision) and the second is through heat.

In many instances, the events which lead to a serious fire are as a result of a crash. In tunnels, tunnel crashes often involve the walls of the tunnel and where the ceiling is low enough could conceivably involve the ceiling as well.

Regard must be had to the risk of vehicles compromising the operation of suppression systems when the crash occurs. Ideally, this should include some form of physical protection for the suppression system along the walls of the tunnel (or isolation system) and sufficient separation vertically to protect the suppression infrastructure from

3. PIARC TECHNICAL COMMITTEE ON ROAD TUNNELS 2008 "Road tunnels: an assessment of fixed fire fighting systems"

4. A. Voeltzel, A. Dix, "A Comparative Analysis of the Mont Blanc, Tauern and Gotthard Tunnel Fires", Routes/Roads Magazine, No. 324, World Road Association (PIARC), Paris, France, 2004.

5. Personal communications from Japanese road agency – Tokyo 2007

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The effective use of fixed fire fighting systems demands a systems engineering approach to integration of the deluge system. From its initial design to its integration into emergency ventilation and alarm systems its successful operation in an event is critical to protecting the welfare of tunnel users and tunnel infrastructure.

being compromised in an incident. What constitutes an appropriate treatment for protection of this physical harm of the suppression infrastructure will depend from application to application.

There is also a risk of thermal damage. The best protection for the system from thermal damage is often early and accurate activation.

Conclusions

FFFS are contemplated by PIARC and NFPA as legitimate means of managing tunnel fire risks. Determining the circumstances appropriate for FFFS use requires a considered and systematic approach to managing fire risks.

The effective use of fixed fire fighting systems demands a systems engineering approach to integration of the FFFS system. From its initial design to its integration into emergency ventilation and alarm systems its successful operation in an event is critical to protecting the welfare of tunnel users and tunnel infrastructure.

Timely and accurate activation are central to achieving a positive outcome when confronted with a tunnel fire.

Such effective use will only occur where the systems have been designed, integrated, maintained and routinely exercised. When the Burnley Tunnel City Link investigation results become public the importance of these factors will be revealed. **APF**

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13. W. Connell and J. Gamache *Over View of NFPA 502 Standard for Road Tunnels, Bridges and Other Limited Access Highways, 2008 Edition* – 2007



Professor Dix is a specialist tunnel adviser and sits on the tunnel fire standards committees of NFPA 130 (rail) NFPA502 (road) and PIARC (World Road Association). He was responsible for proposing the successful amendment of NFPA 502 in the USA to include fixed fire suppression as an option and is one of the authors of the latest PIARC report on fixed suppression systems which heralded PIARC's change in policy with response to these systems.

Dix is currently the task group leader of the next PIARC report on fixed fire fighting systems and a member of the special task group on design fires. Dix is also the Coroner's investigative tunnel expert into the Burnley Tunnel incident and constrained by operation of Court Order from disclosing his findings prior to Court proceedings becoming final.

Spiral nozzle in a well designed Australian Deluge system. This nozzle was selected due to its performance in petro-chemical fires in windy conditions

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Selecting a Mass Notification System

By Patrick Stuver
& James Keene

3n Global

Mass notification systems are becoming an integral part of both emergency and non-emergency communications for organizations of all sizes and in all industries. The benefits of mass notification are already being applied by organizations to increase revenues, cut or avoid costs, and minimize the loss of human life. Organizations have many options when selecting a system vendor. This paper examines in detail the considerations fundamental to selecting an appropriate mass notification system for any organization.

When you need to deliver time-sensitive information to hundreds or thousands of people, a mass notification system can help you get the word out quickly and efficiently. But how do you know which system is right for your organization?

An airline makes an eleventh-hour change to its flight schedule and has to notify all passengers . . . a school must alert parents about an unplanned early closing . . . a pharmaceutical company needs to pull a recalled product batch off the shelves of thousands of retail stores.

Until recently, organizations had only one way to respond to these and similar scenarios: round up all available staff, seat them in front of telephones, and hand them lists of phone numbers. Organizations that are able to plan ahead might use "phone trees," where each person receiving the message relays it to others on the list.

But emergency phone banks and phone trees don't work very well. At best, calling large numbers of people is expensive, and diverts staff from other tasks. At worst, the message will arrive too late for most people to act.

And many people will never get the message at all. Phone trees are easy to break; if some of the first tier aren't contacted, the people on their "branches" won't be, either, unless the original caller – usually an incident manager with more important things to do in a crisis – calls the second tier as well.

Even with centralized calling, quality control is a problem. Anyone who has ever worked on a military personnel callup or a voter registration drive knows that when dozens of operators are placing calls, it's easy to lose track of who has been called and who hasn't. Coordinating the effort becomes increasingly difficult, and inevitably some people on the list receive multiple calls while others are never notified.

In the last few years, business and government continuity planners have begun using mass notification systems to expedite crisis responses. Mass notification systems use computer technology to deliver recorded messages to large numbers of people in a very short time. Often, they can send messages through multiple communications channels – not just telephone, but also email, pager, fax, PDA, and other channels. They are faster, more accurate, more effective, and less expensive than manual systems.

Finding the right system

There are many mass notification services on the market today. These offerings vary widely in scale,

functionality, and cost. Comparing each and every individual feature in order to choose among them would be time-consuming and possibly confusing.

But you don't need to review every offering in detail in order to make a selection. Many of these systems are appropriate only for limited applications. If you want to coordinate a municipal response to a terrorist attack, for example, you don't need to look at systems that are designed only for paging repair crews.

Asking a few basic questions can help you narrow the choice to products that are appropriate to your organization.

These questions are:

- Who operates the system, the purchaser or the vendor?
- Is the system designed to contact the people you need to reach?
- Is the system scaled to your current needs and scalable to your future needs?
- Is the system completely reliable?
- How flexible is the system?
- What is its pricing structure?

Who operates the system?

Some mass notification systems are operated by the organizations that use them, while others are operated by vendors.

With a vendor-operated system, you pay a fee for service, just as you might pay for telephone or Internet service. Fees may be based on usage, on the number of users, or on other criteria (see "Pricing Structure" below for a more detailed explanation).

On the other hand, if your organization will be responsible for operating the system, you purchase the computer hardware and license the software from the vendor. Hardware is usually purchased outright, while software is usually licensed on an annual basis.

But operating a system in-house also imposes other costs and responsibilities. Both hardware and software must be upgraded regularly, since vendors support only recent versions of their products. IT professionals must be hired and trained to maintain and upgrade the system.

With an in-house system, you must also maintain telephone lines and hire and train operators to initiate notifications. You must also supply space for the computers, systems professionals, telephone operators, and managers who oversee the system. Finally, if this is a system that will be needed during emergencies, you must maintain backup computers, electrical generators, and telephone lines.

Choosing between in-house and vendor-operated systems:

	In-house	Vendor-operated
Technical expertise required	Higher	Lower
Cost efficiency	Lower	Higher
Risk of unavailability	Higher	Lower
Ability to integrate with other systems	Lower	Higher
Control over system	Higher	Lower

Technical expertise: An in-house system requires technical personnel to maintain the hardware, software, and communications network. For organizations that already run many complex systems and have strong IT management skills, adding a mass notification system may not pose a great challenge. Smaller organizations, or even larger organizations that outsource processes beyond their core competencies, usually prefer to leave technical issues to knowledgeable vendors. When companies without technical expertise attempt to run complex systems in-house, they either fail to use the systems, use them ineffectively, or become entirely dependent on the vendor to make decisions. All of these options are both costly and risky.

Cost efficiency: Because they are scaled to peak use, mass notification systems tend to be underutilized most of the time. Organizations can find cost efficiencies by sharing capacity in a vendor-operated system with other users who will be sending notifications at different times. However, not all vendor-operated systems are shared; those that offer dedicated capacity are no more cost-efficient than in-house systems. In addition, the potential savings from capacity sharing depend on the system's use. An organization that uses mass notification extensively for routine communications may achieve an acceptable utilization level with an in-house system.

Risk of unavailability: If the mass notification system will be used only for routine communications and is not part of a disaster preparedness plan, then the risk of unavailability is not especially important. But if the system is critical to business continuity, it must be available during a disaster. The same natural or man-made disaster that destroys an organization's facilities or makes them inaccessible must not also put the notification system out of commission.

To ensure that the system will be available when it's needed, it's important to locate the computer far away from the organization's other facilities, and to maintain backup systems in other locations. While this is possible with an in-house system, it adds considerably to the management challenge. Usually, if a system must be operated in multiple remote locations, it's simpler to have a vendor manage it.

Ability to integrate with other systems: If your organization uses a business continuity planning tool, integrating this system with the mass notification system might be advantageous. For example, you might want contact lists created in one application to be automatically available to the other one.

Control over the system: Finally, some organizations require a high degree of control over their notification systems. If it is critical to your business objectives that you be able to add customized features to the system, or ensure that no other user's messages will ever have priority over yours, or control the timing of scheduled maintenance, it may be easier to achieve these goals with an in-house system.

Contacting the right people

In some situations, you need to contact specific people – employees, customers, suppliers – while in

other situations you may want to contact everyone who lives in a targeted geographic area.

Geographic notification (sometimes called “reverse 911”) is necessary for evacuating communities threatened with natural disaster, posting warnings about escaped convicts or missing children, and advising residents of toxic spills or other local hazards.

Individual notification is more appropriate for emergency response and recovery. Calling up military units in a crisis, notifying hospitals about mass casualties, canceling a work shift because a plant is unavailable, and polling employees to make sure everyone is accounted for after a fire are examples of crisis-response applications.

The mass notification system you select should be designed to contact individuals, geographic areas, or both, depending on your requirements.

• Geographic versus individual: It's not just how you build the list

Contacting known individuals is very different from blanketing an area with phone calls. It isn't just a matter of how the call list is compiled; these two types of notification serve different purposes.

Geographic notification is personalized broadcasting. It's more effective than radio broadcasting, especially when people don't know they should be listening for an announcement. It's also more precise – for example, people closer to the hazard can receive more urgent messages than those further away. But, however sophisticated it is, this type of messaging is still one-way communication with people whose individual identities aren't particularly important.

Contacting known individuals is quite different. The individuals on your list have specific skills or responsibilities. Reaching all of them and recording their responses is critical to managing your crisis response. If you're calling parents to pick up children from school, you need to make sure every child is accounted for. If you're calling volunteer firefighters to the scene of a fire, you need to know how many of them are on their way.

Some services that originally provided only geographic notification have now added list-handling capabilities. But even if they can contact specific individuals, they may not be well suited to this task.

In order to be appropriate for contacting known individuals, a notification system should have these features:

- User-friendly procedures for updating contact lists
- Unlimited attempts to make contact with each person
- Contact path for each person that includes all their telephone numbers, pager numbers, email addresses, and other device addresses
- Confirmation and polling (“press 1 if you are in the office”)
- Real-time reporting on confirmations and polling responses
- Unlimited sublists
- Ability to make international calls

Adequate scale

A critical consideration is whether the system, including communications facilities, is scaled to your current and future needs. Scale is particularly important for organizations with lengthy contact lists and short notification timeframes. But some scale issues, such as whether the system supports multiple simultaneous users, can be relevant even to smaller organizations.

• System issues

System capacity depends on the underlying platform (operating system, database management system, and other system software), the application architecture, and the hardware.

A system to which you have dedicated access, whether it is operated in-house or by the vendor, should be capable of processing transactions at the maximum speed you require – for example, if you need to contact 10,000 individuals in 15 minutes, the system should be capable of this.

The system must also be scalable, or capable of expansion to higher capacities. Not all platforms and architectures are easily scalable. Since you can't be sure of your future needs, and since you are even less able to forecast the demands by other clients on a shared system, selecting a system that is not easily scalable would be a mistake.

Shared systems must also be capable of serving concurrent users. If your organization has an emergency message to send out, you should not have to wait for another organization's notification to complete. Notification systems that were originally designed to operate in-house (that is, serving a single user) and are now being offered as shared, vendor-operated systems may not serve concurrent users reliably.

• Network issues

No matter how fast the computer system is, it can't place calls without telephone lines. In an in-house system or a dedicated vendor-operated system, you will have to contract for enough telephone lines to place the maximum number of calls required in a worst-case scenario. This is such an expensive proposition that such systems typically don't have anywhere near enough phone lines.

In a vendor-operated system with multiple users, you will share communication lines with other customers. Therefore, the vendor must have communication capacity several times greater than the maximum requirement of its largest customer. The telephone lines should be dedicated lines, so there won't be outside contention for them. If you plan to use email as well as telephone communication, you (or the vendor) will also need adequate data lines and contracts with Internet service providers.

• Reliability

Mass notification systems prove their worth during catastrophic events. Whether you are responding to a homeland security alert, evacuating those in danger, or simply trying to keep a business operating, these systems can save valuable time and allow crisis managers to focus on high-priority tasks.

Some notification systems are marketed only for use in routine corporate messaging. If this is the only purpose your organization has in mind, then ordinary standards of reliability apply – the same standards you might use when you procure an accounting system, for example. But if you plan to use a notification system to cope with potential crises, much higher standards of reliability apply.

To judge how reliable the system is, you should look at its availability, robustness, security, and track record.

• Availability

In order for a mass notification system to be available, the system itself must be functioning and it must be accessible from wherever you are. Both of these requirements may be problematic during an emergency.



If the system is running on a computer in your offices and the offices are destroyed, the system will probably be unusable. Vendor-operated systems are less likely to be destroyed in the same event, but they are certainly not immune from disruption. Natural disasters, attacks, power failures, human error, and scheduled events such as upgrades can all cause systems to be unavailable.

Even if the system itself is functioning, you won't have access to it from your office if the office is inaccessible. Thus, a mass notification system that can be accessed only from your office computer does not meet the standard for availability.

Finally, communications lines are often damaged in emergencies. A system that can be accessed only by telephone will not be available if telephone lines are down.

Redundancy is the key to continuous availability. Data should be stored simultaneously at two or more separate sites, with switchover and failover features. Multiple application servers should be used, with any single server capable of running the entire system. Backup sources of electrical power should exist. Telephone lines should be leased from multiple phone carriers whose major hubs are in different cities.

And since you don't know where you will be in an emergency or which channels will be functioning, redundant means of access to the system are also necessary. You must be able to initiate emergency notifications through the Web, by phone via Integrated Voice Response (IVR), or by phone via live operators.

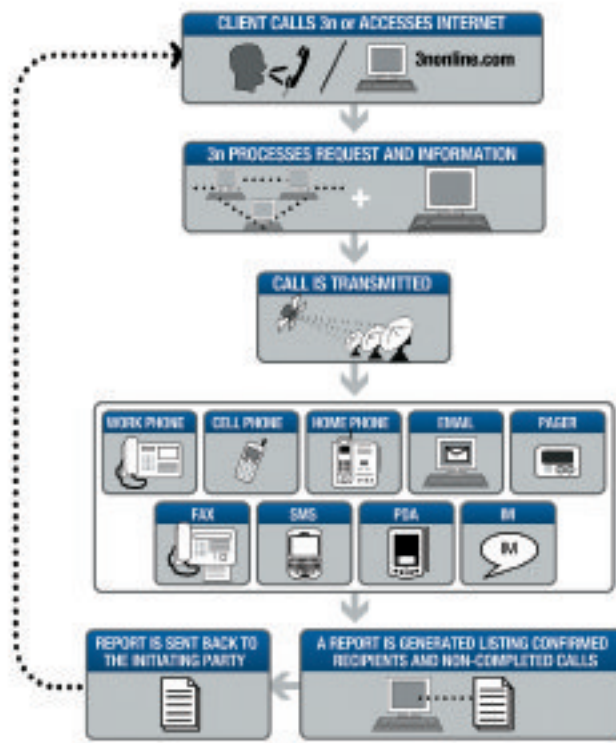
• Robustness

All parts of the system – hardware and software platform, application software, and communications links – must be designed for heavy and continuous use. They should be extremely stable and error-free.

It's important to confirm that the platform is one that has been used successfully in other mission-critical, high-reliability applications.

• Security

Contact information stored on the server must be fully secured. Security isn't just necessary to protect the privacy of the individuals on your list; it also protects your data from tampering. Your contact list,



once developed, is an important business asset. Vendors should be prepared to demonstrate how they can secure that asset.

• Track record

Even a well-designed system can be poorly managed, and poor management can make a system unreliable. You need to confirm that it does, in fact, perform up to specifications during emergencies.

Client references and published accounts can tell you whether messages were sent speedily and correctly, whether confirmations were received and recorded, and – most important – whether the notification system achieved its purpose of getting the right people to the right places at the right time.

It's critical to look at examples that are at least as complex as the scenario you are planning for. A provider may have a good track record for relatively simple cases and not be equipped to handle notification in large, complex crises.

Flexibility

• Adapting to multiple industries and scenarios

If all the mass notification systems you are considering are either niche products designed specifically for your application or products that have been used successfully for scenarios similar to those you have planned, then the adaptability will not be an important issue.

However, adaptability is very important when vendors can't reference customers similar to your organization. To be confident that the system will support your application, make sure it has been used successfully in a broad range of industries and scenarios without special programming or training.

If you can't be confident that a system will be easily adaptable to your scenarios, then you may have to add the following costs to your estimated total cost of ownership:

- Custom programming and training
- Developing "workarounds" to accommodate your organization's needs and training your staff to use them.

- Giving up some of your requirements and settling for not being able to work in the most efficient way possible.

Serving both emergency and routine use

If you have determined to use mass notification only for routine communications or only for emergency communications, then the system's flexibility will not be a concern.

However, many organizations decide to purchase mass notification systems as part of their continuity-of operations plans, but intend to use the systems routinely as well. Since non-emergencies by definition greatly outnumber emergencies, these organizations realize return on investment faster by incorporating the systems into everyday communications with employees, customers, suppliers, and members. Some of the routine uses for mass notification are:

- Keeping remote sales teams updated about product changes and sales goals.
- Sending official news and announcements to the families of servicemen on active duty.
- Letting clients know you've moved to a new address.
- Communicating with parents about their children's school absences.
- Rescheduling meetings with many attendees.
- Reminding an organization's membership about upcoming events.
- Immediate conference call bridging.

Most organizations already use email lists for routine messaging. But a mass notification system with multiple contact channels offers several important advantages over email-only systems:

- 1 Even non-emergency notifications may be time-sensitive. Email isn't useful when messages must be received quickly – for example, to cancel or relocate a meeting at the last minute. A mass notification system can proceed quickly to telephone or pager when an individual doesn't respond to email.
- 2 While email systems can request confirmations, they don't compile those confirmations into reports. When HR managers use a mass notification system to send a benefits update to 8,000 employees, they can find out at any time how many employees have confirmed receipt of the message, and print an up-to-the-minute list of those who haven't confirmed.
- 3 Not everyone has an email account. If you're trying to communicate with non-office workers, such as truck drivers or field service workers, multichannel communications will be much more effective.

To serve both emergency and non-emergency use, a system should offer separate contact paths for each type of notification. For example, an individual whose first choice for emergency contact is cell phone might prefer that routine communications be directed first to email.

• Pricing Structure

With an in-house system, as we've discussed, the customer not only pays licensing fees to the vendor but must also pay for telecom fees, system administration, backup electrical power, and so forth. With a vendor-operated system, all costs are included in the vendor's fee.

Vendor-operated notification systems use a variety of fee structures; which approach to pricing is best depends on how you plan to use the system.

• Usage-based pricing

Some plans charge users for each call or call minute. This is the least expensive option if you intend to use the system only for emergencies – and if no emergencies occur.

For list notification, however, usage-based pricing has several drawbacks:

- 1 Usage-based pricing discourages organizations from using their notification services for routine communications. Even organizations whose primary goal is enabling emergency communications often want to get additional use from their systems.
- 2 An organization whose policy is to avoid using its mass notification service risks being unable to use it in an emergency. It's only natural for people to spend time and energy maintaining the systems that are in everyday use, and defer working on those with no apparent benefits. By the time an emergency occurs, users will have forgotten their passwords and the procedure, and will discover that the contact database is months or years out of date.
- 3 Some usage-based pricing schemes keep costs low by permitting advertising messages on the calls. While this might be appropriate for a small membership organization sending out event reminders, most organizations will not want advertisements attached to their communications, especially emergency communications.

• Administrator-based pricing

Some services allow unlimited usage for a single individual, but charge a hefty premium to allow additional administrators to initiate notifications. This may be an appropriate choice for an organization that is concerned about keeping tight control over system usage, and intends to use the system only in emergencies.

This fee structure inhibits non-emergency use of the system. Managers will hesitate – and justifiably so – before asking the emergency coordinator to help them reschedule their meetings or set up conference calls.

Administrator-based pricing is also potentially dangerous in an emergency. If only one or two people are authorized to initiate notifications, and those individuals are killed or incapacitated in a disaster, then emergency notifications will be unavailable.

• Subscription-based pricing

Other services charge an annual subscription fee based on the number of names in the customer's contact list and a selected level of usage. This type of scalable pricing is very affordable for small to medium-sized organizations and gives them an incentive to make the best use of their subscriptions.

This type of pricing has been likened to a cellular phone plan – because an organization selects a usage level and then pays for a subscription to the notification service at that level. Strict subscription-based pricing may become an expensive option for the largest organizations, and for this reason some vendors offer customized pricing – for example, if an organization has more than five thousand regular users.

Selecting a vendor

• Writing a request for proposals

There are two possible approaches to selecting a vendor for a complex product or service: functional and technical. Generally, it is more effective to tell vendors what you wish to accomplish and ask them to tell you how they can meet your needs. The second approach – compiling a list of technical requirements and then comparing these to product specifications – almost guarantees that you will forgo the opportunity of learning from the selection process.

To select the mass notification system that is right for your organization, begin by listing and prioritizing your potential uses for emergency and non-emergency notification. Develop several likely

scenarios for each of these uses. (For examples and case studies of how other organizations are using mass notification, see <http://www.3nonline.com/by-industry>.)

Developing these scenarios will help you define:

- How many contact lists and sublists you will need.
- How many names will be on each list.
- How accurate the contact information needs to be.
- How many messages you will need to deliver, and how quickly you will need to deliver them.
- How your requirements for list size and delivery speed will grow over time.
- Your need for system reliability.

If you are considering purchasing an in-house system, you also need to consider who in your organization will be responsible for maintaining the system, your organization's current IT environment and IT skills, and where the computer hardware and system operators would be located.

In your Request for Proposals (RFP), you can let vendors know how you plan to use mass notification and what your functional requirements are. You can then ask them to address each of those requirements. For example, you might ask, "How will you help us maintain a contact list that is 99.9 percent accurate?" or "How will you help us train staff to use the system correctly?"

You can find a prepared, downloadable model RFP at 3n Global's Resource Center (visit <http://www.3nonline.com>).

• Selection criteria

The most important criterion for selecting a mass notification vendor is, of course, how well the vendor understands and meets your requirements. But you will probably also want to use additional criteria, such as:

- The vendor's track record in providing services on the scale that you require.
- How quickly you can begin using the service (time needed for setup, list preparation, and training).
- The vendor's financial stability.
- Your expected return on investment (ROI).

Calculating return on investment

Calculation of ROI has been called both an art and a science: while the concept is simple, the calculation can be very difficult. In its simplest form, ROI is equal to cost savings or avoidance, plus increased revenue, divided by the cost of the system.

An organization's cost savings, cost avoidance, and increased revenues, however, will depend on how it utilizes the mass notification system. System cost may also vary with how, and how often, it is used – particularly if the selected vendor is usage-based.

Non-emergency users of mass notification can try to quantify the benefits of improving overall communication within their organizations, with key suppliers and vendors, and with customers. Time savings is one key element. For example, a mass notification system might reduce product time-to-market and the time required to correct business errors. Increased communication speed and efficiency will also improve employee productivity and overall customer satisfaction.

When selected for emergency use, a mass notification system is capable of saving precious time in crisis, and may even be responsible for saving lives. There is hardly a way to quantify such a powerful benefit in dollars. When calculating ROI, the risk of *not* undertaking a purchase or project is sometimes overlooked by organizations. In the case of mass notification, this mistake could be devastating. Gartner Dataquest estimates that two out of five enterprises that experience a disaster go out of business within just five years.

APF

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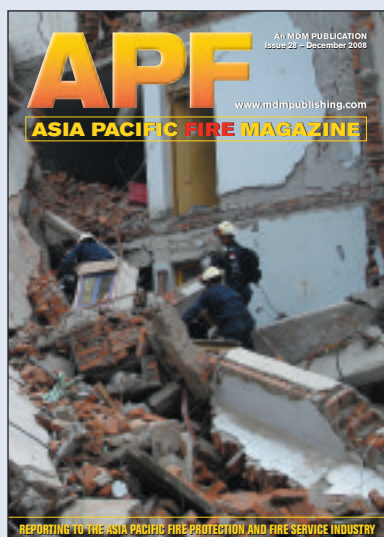
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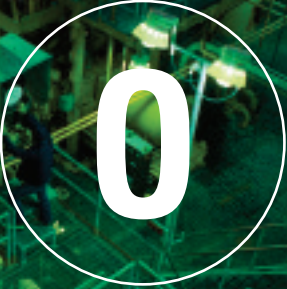
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F

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O

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A

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M

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